Better Crops WITH PLANT FOOD

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Ewing Galloway

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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

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American Potash Institute, Inc.

Investment Building, Washington, D. C.

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TIME OUT FOR A WELL-EARNED DRINK.

Better Crops with PLANT FOOD

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VOL. XXI WASHINGTON, D. C., JUNE-JULY 1937 No. 8

Jeff goes up to bat for —

Alfalfa Athletics

Jeff McDermid

IF I AM elected to Congress before all the Government money gives out and before the taxpayers start a sit-down strike, my maiden speech will *not* be on economics. It will touch a new and refreshing viewpoint naturally expected of one who has harbored so many inspirations. I shall lift sundry buckets of rhetoric from the "well of the House" in favor of my bill to establish a new Federal corporate authority called the Rural Athletic Talent Syndicate (RATS).

Its object, as it will appear spread in the appendix of the Record (to make my constituents think I "spellbound" for two whole hours instead of five minutes), will be to underwrite and encourage, promote, foster, finance, and perpetuate the swatters and sweaters of rural athletic America, who by organization of a new alfalfa league will do much to keep pastures pleasant, cows contented, and enable their owners and chattel mortgagors to forget drought, hard times, and painful, soil-depleting regulations.

My bill will put the generous Government—or what is left of its generosity—squarely behind rural relaxation by giving the hay-shakers a free day weekly in the bleachers, always providing that milk be substituted for beer and that no oleo be used to butter the pop-corn; likewise, that the um-

pire shall not be one known to favor reciprocal agreements or putting women on the supreme court.

Precedent and reason dictate my choice of a fighting cause, and I am not so sure that taxpayers would complain much either. Most of them spend plenty for athletics now, and this scheme would give them a series ticket in exchange for their tax receipts—which is a blamed sight more than many of them get at present.

MOREOVER, the public appreciates that the bush league plow-pushers have been the best bets for major scouts during the past 50 years of baseball, not to mention big Swedes from up-state forties who crashed down goal posts, and steam-shovel mat maulers who kept Iowa corn-huskers triumphant wrestling champs over eye-gouging Greeks for two decades. The patient paying public knows that the talent is ready if Uncle Sam will furnish the tin to finance suits, seats, and sustenance. My bill is sure to bring in resolutions from every cross-roads post office, and the wires will be scorched plenty.

My second valid excuse for mentioning this grand and comprehensive plan well in advance of its adoption is the condition in which we find agriculture today. Consider, my friends, and then instruct your budding legislators to follow my flag in the pennant race and cast their votes for HR something-or-other.

What then is the situation in which we find the denuded and inundated dirt leaguers? Simply this: That returning prosperity, in the wage of an awkward wakefulness and since the preservation of the "round" dollar has caught the hog-callers off their guard in respect to callisthenics. Now that farming has become so automatic and mechanical with all these many gas gadgets and push-button arrangements, the ruralites must go in for personal athletics in order to get some exercise. The dyspeptic roll-top desker has nothing on them. Farm electricity saves steps but it slows up digestion. If we do not arouse them by Government subsidy into a sharp participation in everything lively short of enlisting in the Spanish war, they will join their old horses in a genuine case of azoturia.

Calli no longer decorate and distinguish the honest palms and rugged soles of our agriculturists. They are found in the seats of their pants. Instead of using so much lubrication grease to loosen the pitmans and tumbling rods of farm implements, let RATS be established to hire trainers to rub incense and lotions into the muscles of farm athletes, thereby saving on mineral oils and giving zest and joy to the populace on the benches.

THIS in turn suggests another reason for my propitious proposition. Bucolic audiences have so long been put into trances, comas, and dreams by wordy economists and plow-land planners that they have forgotten how to cuss an umpire, toss a pop bottle, or read a score card. That this is too un-American and unnatural for our tradition of carefree, country carelessness needs no proof. The great American emblem is the eagle, but lately we have made a shrine for the lugubrious owl. What we need is a bracer of the same kind that gave us Abe Lincoln, Ty Cobb, Billy Sunday, and Will Rogers. Weak-kneed solemnity and intellectual gymnastics won't take the place of fresh air and a little fun. We face a heck of a long time in the bone-yard but too short a space in the ball park!

Talent is begging for its chance to cavort. Put long-armed hay pitchers on the mound, deft pig catchers behind the plate or spraddling at short. and blue-streak dinner-bell responders running the bases for home!

Though Illinois has borne the sucker title lo these many years, we must hand it to them for their farm-bureau ball-league idea, now more popular than Father Devine in Harlem. This and the corn-husking extravaganza have lifted agriculture further from the slough of despondency than benefit payments and corn whisky. It would

take a mighty mean-minded customer to keep right on thinking of "parity" when the old ball game had got into 12 innings and two bozos were out with the bags full! If any trained seal among the select ones in Congress can think of slicker salve for a blistered bank account, let him speak out before roll call on my measure. Otherwise I'll have it under the President's nose for signature in a couple of shakes! Not even the histrionic ability of Senator Ashurst could block RATS when the story is all told.

MY plea is for keeping the best athletic brains on the ranch instead of letting them go to the city. Bob Feller is not the first young feller to jump from the farm to fame just by a talent for throwing something away. King of all the rubes who went from haystack to diamond was the Big Train, Walter Perry Johnson. He was the son of a Humboldt, Kans., farmer, and finally he was scouted by a Washington fan while he was smoking 'em over the pan at Weiser, Idaho. Walter cost the Nats only $250 and carfare! Five presidents tossed him the opening ball in Griffith Stadium. He played 807 games and had 3,949 strike-outs in 5,916 innings, with 110 absolute shut-outs on his ledger. A few other farm marvels might be added, including old Cy Young, of Boston; Rube Waddell, the eccentric south-paw; Christy Mathewson, with 83 shut-outs in 17 years, and the universal favorite, Grover Cleveland Alexander.

WE need more of the play spirit in agriculture, because the traditions to date have been much the opposite. My forebears at any rate were too engrossed with weeds and warpaths to mind much about sports, although if I inherit all the zest of an uncle or two of mine when bears were plentiful, I must have real hidden talents for the track. There were of course certain moments of relaxation, which history hates to admit in recitals of the prowess and backwoods statecraft of the departed generations.

It is claimed that in colonial times the Dutch played ball with a lopsided sphere stuffed with horsehair. There was no limit to the number of players or the amount of liquid refreshments, and to retire a base runner it was needful to swipe him with the ball on some portion of his anatomy that would halt him dead and put him out in more ways than one. This was tamer sport, however, than the burghers enjoyed in the times of Peter Stuyvesant. For then clubbing the cat and pulling the goose were leading outdoor pastimes. The feline was knocked out of a loosely staved cask, and the goose with greased head was yanked off the ground by contesting horsemen who leaned over and tackled the bird at the neck in passing. If the Dutchmen had visioned the shining mark destined for umpires and referees they would have abandoned the cat and goose games as mild imitations.

Baseball had a country birth in its

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Fertilizer Response On Colby Silt Loam

By F. L. Musbach

Marshfield Experiment Station, Wisconsin College of Agriculture, Madison, Wisconsin

THE Colby silt loam occupies an area of nearly 5,000 square miles in central Wisconsin. This important soil type embraces the largest area of generally uniform soil found perhaps anywhere in the United States. The basic material constituting the soil mass is granite, which underlies the region. The entire area has been worked over by old drift sheets, and part of it by more recent ice sheets which at one time covered much of the state.

Because of the material involved in its origin the supply of potassium is relatively high, ranging from 35,000 to 40,000 pounds per acre to a depth of 8 inches. The phosphorus content averages 1,200 to 1,500 pounds. Since neither the parent material nor the drift contained lime carbonate, the soil is acid ranging from a pH of 5.0 to 5.5.

Natural Grass Country

Texturally the soil is largely silt loam, comprised of 60 to 70 per cent silt, 10 to 12 per cent clay, and the balance of various sized sand fractions. The subsoil is a mottled, silty, clay loam rather impervious to movement of water.

Because of the texture and the tight subsoil, the region is considered a natural grass country. In the early years clovers made excellent yields. With increasing age a gradual change has occurred in the soil, making it more difficult to maintain stands of these legumes. Alfalfa is not a dependable crop even when the acidity has been reduced and the mineral requirements satisfied.

The Marshfield Experiment Station was established in this area and researches on soils and crops have been carried on intensively. The station farm has been under crop not to exceed 40 years, and much of it less than a quarter of a century. Throughout the Colby area the income on farms has come from the livestock enterprise, yet under this system of farming, in a relatively short period marked soil deficiencies have manifested themselves. The result is noticeable in the stand of forage, particularly legumes, and in the yield and quality of grain crops produced. Clover failures are usually attributed to changing weather conditions, but as a matter of fact these failures are due more often to the need of available plant food—lime, phosphorus, and potash.

Some work herein reported is of interest in connection with crop response to various fertilizer treatments. The field upon which these plots are laid out has been under plow approximately 30 years. The entire field was limed at the rate of 4 tons per acre during the past 8 to 10 years. The rotation originally was alfalfa 2 years, corn, and barley. Due to the uncertainty of alfalfa the seeding mixture now consists of 4 pounds of timothy and 10 pounds of alfalfa. All of the plots (in quadruplicate) received a

TABLE NO. 1.—CROP YIELDS WITH USE OF VARIOUS FERTILIZER MIXTURES

No.	Fertilizer treatment	Barley—Grain, bu.	Barley—Straw, lbs.	1st yr. hay, lbs.	2nd yr. hay, lbs.	Corn—Grain, bu.	Corn—Stover, lbs.	Fertilizer cost
1	Control	22.61	2,156	4,861	4,008	45.81	2,320	....
2	250# 0-20-0	28.30	2,180	5,230	4,421	47.58	2,542	$3.18
3	250# 0-20-10	31.36	2,294	5,470	4,669	51.61	2,552	5.01
4	250# 0-20-20	32.91	2,445	5,580	4,860	51.90	2,645	6.24
5	250# 2-20-10	32.15	2,364	5,557	4,718	51.30	2,696	5.47
6	250# 0-20-20 on 1st. Yr. Hay	24.48	2,251	5,776	4,596	52.05	2,677	6.24
7	600# Rock Phos.	25.30	2,218	5,084	4,430	50.35	2,359	5.18
8	600# Rock Phos. 100# Mur. Potash	28.19	2,459	5,374	4,818	50.23	2,241	7.43
9	111# 0-45-0	28.97	2,277	5,091	4,415	50.38	2,692	3.03
10	111# 0-45-0 and 150# Gypsum	28.61	2,240	5,214	4,233	50.38	2,515	4.30

uniform manure treatment of 8 tons per acre, and 125 pounds of 0-16-4 in the hill for the corn crop. The various commercials shown in the table are applied on the barley crop with one exception, and that is where the first-year hay crop receives the treatment. In table 1 the yields for the various crops are indicated. The barley yields are for an average of 5 years, and each of the other crops for a 2-year period.

It will be noted that each of the different treatments resulted in increased yields, but that considerable variations in yields are secured depending upon the composition of the fertilizer and the crop to which applied.

In order to examine more conveniently the value of crop response, table 2 has been prepared giving the total value of the four crops, and also segregating the increased values of each of the four crops. Corn is valued at 75c per bushel; stover at $4.00 per ton; barley at 75c per bushel; straw at $3.00 per ton; and alfalfa-timothy hay at $12.00 per ton. The control receiving no commercials produced crops having a total value of $115.65. The application of 250 pounds of 0-20-0 gave a value of $126.42 or an increase of $10.77 over the control. Of this $10.77 representing the increase over the control, the barley crop is responsible for $4.33; the two hay crops, $4.69; and the corn crop, $1.75.

The response to various phosphorus carriers is interesting. As will be noted, phosphorus is derived from the

The barley on the left was fertilized with 250 lbs. of an 0-20-10 per acre and yielded 34.1 bushels. On the right where no fertilizer was used the yield was only 18.3 bushels per acre.

soluble 20 per cent, and 45 per cent superphosphates, and the less easily soluble rock phosphate. The latter is used at the rate of 600 pounds per acre, the soluble phosphate at the rate of 250 pounds of the 0-20-0, and the equivalent in phosphoric acid where the 0-45-0 is employed. Because of the calcium sulphate contained in the 0-20-0, one set of plots is included in which 150 pounds of gypsum are added to the 0-45-0.

As indicated, the soluble phosphate gave an increased value of $4.00 to $5.00, whereas the rock phosphate returned somewhat better than $2.00 for the barley crop. In the case of hay the residual effect shows less differences though on the average somewhat better results were obtained with the soluble carriers than with the finely ground rock.

While the various phosphorus carriers have been used at a profit in all instances, yet it appears that phosphorus used alone is insufficient to produce the maximum benefit. This is brought out clearly where potash has been included in the 0-20-10 and in the 0-20-20, also where muriate of potash supplements rock phosphate. In the latter case the same amount of K_2O was added as is contained in 250 pounds of the 0-20-20. In the case of the 0-20-10 the value of the increase of the four crops over the control plot is $19.38, and stepping up the potash to 20 per cent secured the largest increase, $23.23. Again the potash effects may be studied in comparing the rock phosphate treatment with that where the same amount of rock phosphate was supplemented with 100 pounds of muriate of potash. The increase for rock phosphate alone is $9.54 as compared with $16.16 for the rock phosphate-potash plot.

The benefits of nitrogen are brought out in the comparison—the 0-20-10 with the 2-20-10 both applied at the same rate. The total value of the increase for 2-20-10 is $21.07 as against $19.38 for the fertilizer without nitrogen. Nitrogen apparently has been of benefit not only for the barley but also the hay crops.

One other plot is included in which 0-20-20 is applied on the first-year hay instead of on the grain crop. The value of the increase is $16.08 as compared to $23.22 where the same fertilizer is applied on the barley crop. The increase in the first-year hay is $5.49 as compared to $4.31 for the 0-20-20 applied on the barley. The grain crop coming the fourth year later shows very little effect of the

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TABLE NO. 2.—TOTAL VALUE OF CROPS AND OF INCREASES DUE TO VARIOUS FERTILIZER MIXTURES

No.	Fertilizer treatment	Value of crops					Total value of increase over control	Value of increase secured by each of the four crops			
		Barley	1st year hay	2nd year hay	Corn	Total		Barley	1st year hay	2nd year hay	Corn
1	Control	23.43	29.17	24.05	39.00	115.65	....	...	...	...	...
2	250# 0-20-0.....	27.76	31.38	26.53	40.75	126.42	10.77	4.33	2.21	2.48	1.75
3	250# 0-20-10.....	30.40	32.82	28.01	43.80	135.03	19.38	6.97	3.65	3.96	4.80
4	250# 0-20-20.....	32.01	33.48	29.16	44.22	138.87	23.22	8.58	4.31	5.11	5.22
5	250# 2-20-10.....	31.20	33.34	28.31	43.87	136.72	21.07	7.77	4.17	4.26	4.87
6	250# 0-20-20 on 1st yr. hay	25.11	34.66	27.57	44.39	131.73	16.08	1.68	5.49	3.52	5.39
7	600# Rock Phos...	25.63	30.50	26.58	42.48	125.19	9.54	2.20	1.33	2.53	3.48
8	600# Rock Phos. 100# Mur. Potash.	28.51	32.24	28.91	42.15	131.81	16.16	5.08	3.07	4.86	3.15
9	111# 0.45-0.....	28.56	30.54	26.49	43.17	128.76	13.11	5.13	1.37	2.44	4.17
10	111# 0-45-0 and 150# Gypsum	28.18	31.28	25.40	42.82	127.68	12.03	4.75	2.11	1.35	3.82

The pines planted on this badly eroded slope in southeastern Ohio need help such as locusts, lespedeza, and other legumes could give to accomplish erosion control and restore the slope to production.

Controlling Soil Erosion In Northern States

By A. F. Gustafson

Professor of Soil Technology, New York State College of Agriculture, Ithaca, New York

DURING the centuries before the white man came to America the soil was protected by vegetation. In parts of the Midwest and on the Great Plains the soil was held in place by prairie grasses and by trees along some of the larger streams. In the East the forest with its litter-covered floor prevented soil erosion. In these forested areas bottom lands were covered originally with trees. This suggests that the alluvial soil was deposited in its present position before the adjacent uplands attained vegetative protection.

Soil erosion as a serious present-day problem dates from a time shortly after the pioneer destroyed the protecting vegetative cover. Burning it in preparing the land for cropping exposed the soil to the action of wind and water. In the early days land that is now regarded as too steep for cropping was needed for food production. Immediately after clearing, these steep slopes produced good yields of wheat; but as the original organic matter decomposed and disappeared, and as readily available plant nutrients were used up, crops failed to protect the soil from washing.

Rich topsoil is being lost by erosion from highly productive lands more rapidly than is generally appreciated. Spring dust storms are becoming an

almost annual affair. The work of the wind is more spectacular than that of water, yet the latter is highly destructive. Moderately steep slopes planted to corn, potatoes, and beans from extremely heavy rainfall, sometimes for only brief periods. Two inches or more of rain falling in half an hour are not unusual in many sections. Very few soils can absorb so much water in so short a time; much of it therefore runs off and carries surface soil away with it.

Leaving grass in the waterways on this slope helps materially in preventing gully formation. Wider strips of grass would be even more effective.

have lost 50 tons of soil from an acre in 1 year. Since an acre-7-inches of soil weighs 1,000 tons, all of the topsoil may be lost while growing 20 such cultivated crops. If a 4-year rotation is followed and if there is but slight loss of soil during the other 3 years, all of the surface soil may be lost in 75 to 100 years. Such loss has occurred over large areas in the older sections.

Damage from Water

This type of loss, known as sheet erosion, is often unnoticed until, as in the Midwest, the "clay points" that have lost their dark colored surface soil appear. On timber soils poor, thin growth of crops and low yields result from loss of surface soil by sheet-washing. Even gentle slopes lose much surface soil during spring thaws and heavy summer rains.

Sheet erosion is less noticeable than gully erosion which results principally

Heavy short-duration rains cause the most serious damage when they fall on loose, tilled soil or on soil already full of water from previous rains. Every effort should be made to bring about absorption of rain water by the soil. Once water leaves the land on which it fell, it becomes a public problem. Good farm land is ruined by sheet washing and gullying. Good valley land is ruined by a covering of gravel and stones washed from uplands; road and railroad bridges and embankments are washed out; and cities and crops on valley lands are damaged or ruined by flood waters.

Many acres of hilly land have been washed so badly during recent years that forest production is their best use during the next few generations. Rolling soils of somewhat higher pro-

ductivity, especially if they contain some lime, can produce good returns as pasture. In the East the use of phosphorus, and sometimes lime and potash too, accompanied by proper management, produces profitable returns on these lands. A thrifty pasture sward protects the soil against all forms of erosion.

Methods of Control

Moderate slopes may be cultivated safely if recognized soil erosion control methods are practiced. Among these are:

1. Maintaining the supply of active organic matter in the soil by turning under farmyard manure, crop residues, and green manures.

2. Keeping up the productivity of the soil by using lime as needed for legumes and other crops and by using phosphorus, and potash and nitrogen, too, if economical.

Adding phosphorus where deficient is essential for the production of good yields and equally important for the development of large root systems of all crops and of a thick stand of grains, clover, and hay grasses, and a dense pasture sward. Fibrous root systems hold soil against erosion, and a dense cover of grasses protects the soil from the beating of raindrops. Thus vegetation holds the soil against both wind and rain.

Small grains, clovers, and pasture and meadow grasses bring about the absorption of much rain water, consequently less runs away from land thus protected. Experimental work has shown that little soil is lost from thrifty meadows and pastures even on rather steep slopes.

3. Plowing for, and planting and cultivating cabbage, cauliflower, potatoes, cotton, sorghums, corn, and other intertilled crops, and seeding millet, Sudan grass, oats, barley, and wheat on the contour is good practice. The crop rows, as well as the ridges made by implements, hold water against run-off and consequently, the soil against erosion.

4. Building broad-base terraces which are virutally wide, flat-bottomed, diversion ditches is useful on the more moderate slopes where safe outlets may be developed. This, however, is often difficult on long, steep slopes. In the South, and more recently in the Midwest, terraces have attained well-deserved popularity.

5. Cropping in contour strips avoids the erosion that occurs during heavy rains on long slopes plowed and planted up and down hill to a clean-cultivated crop, which is done all too often in many sections. Moreover, contour tillage saves power.

The proper width of strip depends on the length and steepness of slope, type of rainfall, size of the concentration area from which water comes down over the slope, rate of absorption of water by the soil, its water-holding power, and the proportion of slope plowed and planted to intertilled crops at one time. On soils that take up water reasonably well, strips may safely be considerably wider than on tight, clay soils. On slopes of 5 per cent the strips may be fairly wide, but they must be much narrower on slopes steeper than 15 per cent. Growing corn, potatoes, buckwheat, cabbage, beans, or other erosive crops on long slopes steeper than 20 per cent is seldom feasible, particularly on imperfectly or poorly drained soils, because the strips must be too narrow for economical operation. Not more than one-half, and better still, one-fourth of the slope should be plowed at one time.

Water-laid soils wash so easily that slopes of 2 to 5 per cent need as careful protection as do much steeper slopes on glacial or stony soils like those prevailing in the Northeast. Recommending exact widths of strips for various conditions must await the results of further experimental work.

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Replace Plant Food Losses in Crops

By H. L. Garrard

Lafayette, Indiana

"THAT soil won't grow good corn, so I've been growing soybeans for hay for the last four years." This was part of the explanation received when I asked G. Wooldridge, near Lowell, Ind., what made the uneven growth of soybeans, as shown in Fig. 1. I could see that the field would not grow good soybeans either, except in spots. These regularly spaced spots of tall green soybeans amidst yellowish, stunted plants showing symptoms of potash-starvation had aroused my curiosity. I wanted to know what caused their growth. The soil was a black sandy loam, high in lime and low in available potash.

In 1935 Mr. Wooldridge cut his soybean hay and put it in shocks to cure. His barn was full, so he decided to feed the hay from the field during the fall. However, heavy snows came before the hay was fed out, and it became badly weathered. Several rows of shocks were still on the south end of the field when he started to plow the next spring. He scattered out some of the shocks so they could be turned under and the remainder were burned in place.

Fig. 1—Tall green soybeans grew on spots where potash had leached from soybean hay shocks the year previous. The rest were stunted, yellowish, potash-starved. G. Wooldridge farm, Lowell, Indiana.

Starved for Potash

The vigorous green soybeans were growing as a result of potash leached from the shocks of soybean hay. We could not tell where the shocks had been burned and where they had been plowed under. Most of the potash in all plants can be leached out with water as soon as the plants are dead.

Outside of these small green spots, the remainder of the soybeans on this alkaline, black sandy soil were starving for potash, as indicated by leaf symptoms (Fig. 3). No potash fertilizers had been tried on this field.

Another instance of the residual effects of the potash in soybeans plowed under was noted on the farm of W. K. Powers, Duncombe, Iowa. In the dry season of 1934, Mr. Powers turned under a rather poor crop of soybeans in compliance with his AAA contract. The photograph of his corn field (Fig. 2) taken July 11, 1936, shows

the residual effects of potash from the soybean crop two years previous. This soil also was low in available potash, and the corn on the left showed typical symptoms of potash-starvation.

Surprising Losses

The beneficial effects from crops plowed down have been widely noted. Growers should expect a corresponding reduction in fertility when these crops are removed from the soil, yet most of them do not realize (1) just how much plant food is actually required by crops, especially the legumes, and (2) how much is lost from the soil when crops are harvested. These are very important considerations from the soil conservation standpoint. The soil-improving values of legumes depend entirely on whether they are plowed down as green manures, or cut for hay. Legumes are usually considered as soil-conserving crops even though cut for hay, because inoculated legumes do add to, or at least conserve, the nitrogen and organic matter supply in the soil. However, the losses of phosphates and potash in alfalfa, clover, and soybean hay crops are surprisingly great.

To present the picture of actual plant-food losses in crops and the theoretical amounts of fertilizer equal to the amounts of minerals contained in the different crops the accompanying table has been arranged. Ordinary yields of crops, with the pounds of phosphoric acid and potash contained, and an amount of phosphate-potash fertilizer necessary to equal the plant food in each crop are given.

From this table it will be noted that most crops require from 2 to 5 times as much potash as phosphate. The legumes take a greater proportion of potash than the grain crops. Truck crops, especially those grown on muck soils where large yields are possible, require large amounts of these mineral plant foods.

The fertilizer recommendations for muck and peat soils follow closely the approximate plant-food ratios as indicated by the plant-food removals. Although the plant-food removal ratios would remain somewhat the same on heavier silt loam or clay soils, a relatively greater proportion of phosphate is usually advised. These variations in fertilizer recommendations seem more logical when certain differences in the chemical nature of the two types of soil are considered: (1) there is less total potash in peat or muck soils; (2) much of the potash in peat soils is easily soluble, while in heavy silt loam soils the greater potash reserve is in a form which becomes available more slowly; and (3) many silt loam soils are lower in available phosphates. Fertilizer recommendations should be based upon two factors, the plant-food needs of the individual crop, and the supply of the nutrients available in any particular soil at the time.

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Fig. 2—Note the contrast between the potash-starved corn on the left and the corn on the right which shows the residual effects of a soybean crop plowed under 2 years before. W. K. Powers farm, Duncombe, Iowa.

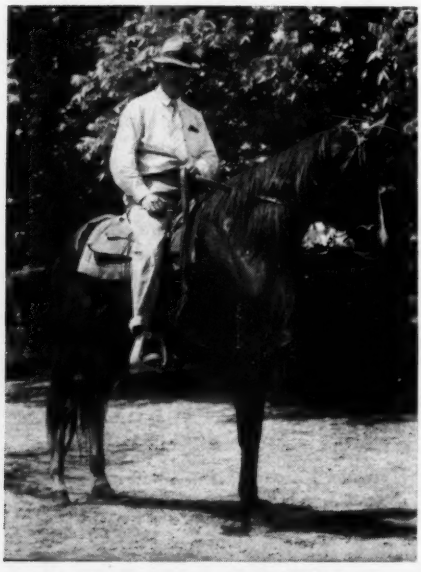
Circle M Ranch Makes A Profitable Comeback

By F. J. Hurst

Extension Editor, Mississippi State College, State College, Mississippi

SCIENTIFIC surveys of the soil to determine its qualities and deficiencies and field plant-feeding tests to ascertain crop-food requirements seem destined to play a more important role in farming in the future. Such steps might have done much to prevent many of the tragic failures in farming in the past.

The story of how Circle M Ranch, a 14,000-acre plantation in eastern Noxubee County, Mississippi, under new ownership and competent management, in a few short years has been brought back from bankruptcy to a status of profitable farming and better living for the 700 people who live on it, is a striking illustration of the value of putting science to work in a practical way on the farm.



Lute Minor, manager of Circle M Ranch.

"Fifteen years ago no one in the community thought cotton could be produced profitably on the plantation," Lute Minor, the alert and keenly observant manager, told County Agent Bode Hughes and me on a recent visit to the famous ranch.

"Yields averaged only a little over 200 pounds of seed cotton per acre. Corn on much of the land would grow up about waist high and fall over. Continued efforts to grow crops successfully failed, and the plantation changed hands," Mr. Minor said.

Although the new owners purchased the plantation primarily as a game preserve and hunting reservation, they were keenly interested in good farming. As successful business men they were not accustomed to losing money on so large an investment, so they determined to make the plantation at least pay its way, and if possible return a profit.

Realizing that if they were to succeed their first problem was to discover the cause of the abnormally low crop yields, the new owners made arrangements with the state experiment station of Mississippi State College to make a soil survey of the farm and to conduct fertilizer tests with cotton.

A large portion of the soil on the ranch is fine sandy loam, a small portion is red clay loam, and a consider-

Quail production is an important part of the farm program, and 40 individual laying houses have been built.

able area is known locally as glade land. The fertilizer tests revealed that the soils were deficient in the essential plant-food elements, and the glade land particularly was highly responsive to liberal applications of potash.

In the three tests with cotton in 1929 and 1930, the experiment station found that an application of 600 pounds of a 6-8-4 fertilizer per acre gave an average increase for the 2 years of 454 pounds of seed cotton per acre on fine sandy loam and 441 pounds per acre on red clay loam.

Needed Complete Fertilizer

The station in bulletin 289 stated that the results indicated that nitrogen, phosphorus, and potash were needed on the soil, and that a 6-8-4 was a good analysis. The test showed, the report said, that 600 pounds were more profitable than 300 pounds or 900 pounds.

In the test on sandy glade land, the station reported that the yield without fertilizer was only 219 pounds of seed cotton per acre. On this land 600 pounds of an 0-8-8 gave best results with an increase of 490 pounds of seed cotton per acre and an added profit of $23.44 per acre. The station reported that potash was profitable on this type of soil up to 48 pounds per acre.

Discovering the need of a complete fertilizer high in potash, Mr. Minor has gradually increased the amount of fertilizer used each year. In 1936 he applied 400 pounds of 6-6-8 on his tenants' crops, totalling 1,500 acres in cotton. He harvested ¾ of a bale per acre from 1,500 acres. On 80 acres of "wages crop" he used 600 pounds of 6-6-8 per acre and harvested 80 bales of cotton from the 80 acres and estimated that about 4 or 5 bales were lost due to late picking.

Mr. Minor attributed the increased yield of a quarter bale per acre on his wages crop to the 200-pound per acre higher application of fertilizer, because he always cultivated his tenants' cotton first and also harvested their crop first.

This year 1,800 acres have been planted to cotton, all fertilized with 500 pounds of 6-6-8 per acre except 10 acres, which were fertilized with 400 pounds of 6-6-15 per acre.

But Mr. Minor does not believe in fertilizer alone. He says that fertilizer will not serve as a substitute for poor stands and good cultivation. He

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Weeds Are "Sissies"— Treat Them as Such

By E. B. Swingle

Publications Department, Michigan State College, East Lansing, Michigan

WEEDS are like humans. For crop pests have peculiar weaknesses just as they have strong points.

On that basis a study by Dr. S. T. Dexter, research associate in farm crops at Michigan State College, has enabled him to hang the label of "sissy" on some of the worst weeds that bother Michigan farmers. So far this list includes quack grass, Canada thistles, and the bindweeds.

Dexter has an inquiring mind that lends itself to the type of experimentation that is considered of service to agriculture. In some of the work he is now conducting, his logic is proving out in field results.

He started on the assumption that weeds were taken too much for granted, or else were attacked with vigor instead of science on the average farm. Experiments for many years have brought out processes and other means of obtaining better yields of desirable crops. Why not study weeds to find out what they like and what they do not like, and then give them the latter?

So Dexter began with quack grass. Projects were started in field tests. One of the first was on a badly infested field usually used for potato production on the college experiment station farm at Lake City. The weed was so firmly entrenched that the field was more like a meadow. Certainly it was a good place to make a test, for results would show up if they were obtained.

With quack grass the reasoning employed was that perhaps the weed could be fooled with fertilizer. An application of fertilizer would certainly stimulate quack, because on the typically light and shallow soil the roots lie close enough to the surface to soak up plant food and any available moisture.

In the spring of 1935 the work began, and results have just been summarized, for it was a project that

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"Where there's no life to rhizomes there'll be no quack," says Dr. S. T. Dexter. He is examining quack grass rhizomes after a sprouting test in a germinator. Those which have had more fertilizer and contain more nitrogen sprout vigorously and then rot, while normal roots continue sprouting and are less susceptible to freezing damage.

The Role of Potash In California Soils

By M. E. McCollam

San Jose, California

TO UNDERSTAND the relation of potash to California soils it will be helpful to set down certain statements which are becoming substantiated in fact, as research progresses.

Although many of our soil types are characterized by present supplies of available potash which appear sufficient for most crops, there are also a great many of our soils which either already have, or are approaching, low levels of available potash. The wide variation which apparently exists in this level of available potash makes impossible any sweeping disposition of the subject of potash in the form of positive or negative recommendations of potash fertilizer for the state as a whole.

Aside from the variation in actual content of available potash in our soils, there exists a variation in the ability of soils to supply potash to the growing plant over a period of time. Some soils which show a rather high test for available potash in the initial years of an intensive cropping program, may become exhausted of potash over a relatively short period of years. Other soils which show much lower readings for potash may be capable of supplying their potash over a long period of intensive cropping at a rate sufficient to maintain a satisfactory production of crops of certain kinds.

In addition to these potash relations another must be considered also. This is the characteristic possessed by some soils which we call the power to fix potash. Again, our soils vary in this characteristic, and the problem of method of applying potash so as to obtain a response becomes a serious consideration on soils of high fixing power, whereas potash response is much more readily obtained on soils of low fixing power.

In pursuing a program of potash research in California, it was thought very desirable to obtain information of a systematic nature on the available potash content of the soils. A great deal of excellent work has been done in the state on physical classification of soils, but there is no comparable volume of data on the chemical nature of soils, including existing levels of available potash.

Determining Availability

During the last few years a cooperative project with the University of California has enabled us to conduct soil sampling and soil testing operations in a number of crop areas. The magnitude which it is possible for this investigation to assume can be realized when we think of the number of soil types in the state. As mapped at the present time about 264 separate Soil Series exist. Within these series are hundreds more of the various soil types, such as sandy loams, gravelly loam, clays, etc., as classified under each soil series.

At least, a start has been made on this work of sampling and testing. The Neubauer test has been chosen and used as the best method for arriving at the available potash content of a

soil. As far as the work has progressed in several crop areas of the state, we can say that a wide variation exists in potash content, and many low readings for potash have been found. Before giving some examples of the range in the readings obtained, it may be helpful to mention the minimum potash requirements of several crops as determined by Neubauer, for the sake of comparison with potash readings obtained in California soils.

NEUBAUER LIMIT VALUES

	Mgs. K_2O per 100 gms. soil
Rye	17
Wheat	20
Barley	24
Sugar beets	25
Alfalfa	35
Potatoes	37

The following tabulation shows the range in potash readings obtained in the first foot of soil in various locations:

RANGE OF NEUBAUER POTASH READINGS CALIFORNIA SOILS

Locality	High reading—mgs. K_2O per 100 gms. 1st foot	Low reading—mgs. K_2O per 100 gms. 1st foot
Hollister area	32	10
Napa—Sonoma area	57	1
Santa Clara Valley area	43	3
Salinas—Watsonville area	46	7
Livermore area	64	14
Oakdale (San Joaquin Valley)	17	4
Chico (Sacramento Valley)	55	8
Southern California (Scattered locations)	49	16

The possibility has been considered that we may be able to work out a correlation between the classified soil type and its available potash content. For instance, it may be possible to say in a general way that our Yolo silt loam soils are well supplied with potash while our Rincon loam soils have a low level of potash. We have not gone far enough with the potash survey to find this out, but there have been enough samples taken on several types to say that there seems to be a trend in some cases. The Yolo silt loam and silty clay loam soils appear with few exceptions in the high and medium potash soil groups. The same is true of Salinas silty clay loam, Metz silty clay loam, and Bale loam. Rincon loam soils appear most frequently in the low potash soil group, as do Goldridge fine sandy loam, Pinole loam, and Farwell loam soils.

That there will be a strong correlation between classified soil type and potash content is very doubtful. It is quite reasonable to expect numerous examples of Bale loams, for instance, showing a low potash level due to exhaustive cropping practices, and there may also be numerous instances of Rincon loam showing a good level of potash due to good soil management practices. With a greater volume of soil sampling and testing we may, however, be able to assign some degree of significance, as far as available potash is concerned, to the physical soil type as classified.

As we are able to expand this soil sampling and Neubauer testing program to other crop areas in California, it appears likely that many other soils will be found which show low readings for available potassium. It also appears likely that more or less extensive local areas of low-potassium soils may be found, such as already exist in the Northern Sacramento Valley, Sonoma Valley, and Santa Clara Valley.

From the standpoint of the potential use of potash fertilizer in California it is of interest that we have found low potash readings in each of the several areas in which work has been done thus far. A brief list of some of the

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High Potash Fertilizers Grow Better Tomatoes

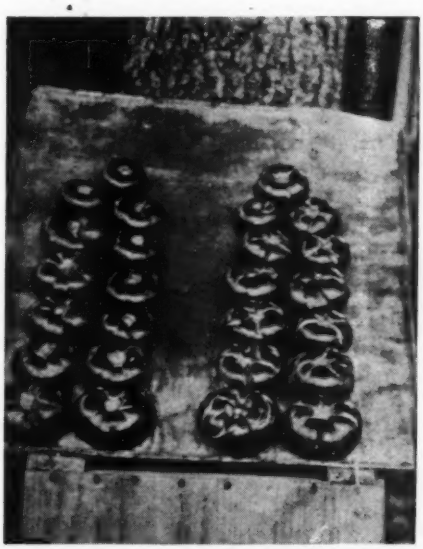
By L. M. Youngblood

County Agent, Vernon County, Indiana

IN ORDER to overcome a deficiency both in yield and quality of canning tomatoes produced on the light-colored slash or silt loam soil of southern Indiana, a definite study of plant-food needs of tomatoes grown on this type of soil was begun in 1931 by County Agent L. M. Youngblood of Jennings County. This type of soil is used largely for tomato productions throughout southern Indiana, because of its great capacity for holding moisture. Results of the study show that greatest profits from growing tomatoes on this soil depend upon the proper amount of potash in the fertilizer used.

At the time this work was started there were at least three things that greatly bothered both the tomato raiser and the canning factories. Tomatoes were ripening very slowly and would not color up uniformly, remaining green around the stem. In addition to this slow ripening, which left a large tonnage of tomatoes in the patch after frost, there were both lateral and vertical cracking around the stem. When the canner trimmed off the green and cracked core around the stem, at least one-fourth of the tomato was gone, and the remainder was not the solid, red, ripe type of tomato that weighed heavy for the farmer or made a quality pack for the canner.

In 1931 4-H Club boys were given various amounts of nitrate of soda, superphosphate, and potash in an effort to see just where the plant-food



The tomatoes on the left received 300 lbs. of 2-8-16 per acre and ripened a deep red evenly up to the stem with practically no cracking. Those on the right received the same amount of 2-16-8 and never got very red, retaining a hard, green core around the stem and cracking badly.

deficiency occurred with the tomato crop. Where the soil was in good enough condition to produce profitable crops of any kind, there was no very noticeable effect in increasing the amount of nitrate of soda or phosphate above the amount normally used in the 2-12-6 fertilizer commonly recommended for tomatoes. However, there was a very noticeable increase in the vigor of the plant and in the yield and quality of the tomatoes where extra potash was added. For example,

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Plant Sudan Grass In Emergencies

By E. N. Bressman

United States Department of Agriculture

FOR July and August the cheapest feed that the average farmer in most regions, except the Far North, can grow is Sudan grass, the annual grass-type sorghum. This crop, a stranger until a quarter of a century ago, when it was introduced from Sudan in north central Africa, was fairly slow in becoming recognized in most farming areas. The very dry years, 1934 and 1936, directed wide attention to the valuable drought-resistant characteristics of Sudan grass, and many farmers who formerly looked upon it as a freak crop now know that it is a reliable crop with many advantages that greatly outweigh its shortcomings.

A Fast Growing Feed

Doubtless, the chief value of this grass lies in its ability to grow rapidly in the hot months when other forage crops languish. It does not make "June in January," but it does make spring pasture in the summer. In addition, when established, it smothers weeds, does not require expensive cultivation, may be used for either pasture or a hay equivalent to the well-known and highly-esteemed timothy. It must be admitted, however, that Sudan grass hay is coarse, as is any crop that will attain a height of 5 or 6 feet within a few months and produce from 2 to 4 tons of hay. The plant stools greatly and is leafy. This offsets the coarseness of the stems. Most growers, however, will be surprised to know that its feeding value is at least equal to that of timothy and is considered by some experts to be even greater.

Adapted to Warm Weather

Sudan grass is a crop that formerly grew in semi-tropical regions. It is adapted, therefore, to the warmest growing conditions prevailing in our general farming areas. Like soybeans, it requires just about the same conditions as corn. Sudan grass, however, and this is important, must not be planted until about 2 weeks after corn-planting time. In Iowa it has been found that best results are obtained when it is seeded from the last of May to the middle of June. In some cases it may be planted even later than the middle of June, but yields fall off rapidly, and late plantings are advisable only under emergency conditions.

Right now the two chief emergency crops are soybeans and Sudan grass. In many ways Sudan grass is superior, since it is cheaper, requires only a fairly well-prepared seed bed, grows more rapidly, is equally valuable for pasture and hay, does not cause bloat, fights weeds better, can be planted over a wider period, and—of real importance—it requires no cultivation. One of the chief limitations of Sudan grass, however, is that chinch bugs attack it readily. It is not, therefore, a good substitute or emergency crop

to take the place of corn damaged by the first brood of chinch bugs.

Sudan grass is not a soil improver, and in this respect is inferior to soybeans. It is not a legume and cannot, of course, be compared with good legume crops, such as alfalfa and clover. This, however, is a small matter when an emergency crop must be grown. Often, the important thing is to get any kind of hay or pasture, however coarse, to carry livestock through the hot summer months. Sudan grass has an extensive fibrous root system, and once established it withstands long hot periods and quickly revives after rains. The root system of the sorghums is much greater than that of corn and is claimed to be more efficient in getting nutrients and moisture from the soil. Also, Sudan grass has the ability to become somewhat dormant in periods of drought, and then revive with the rains.

Ordinarily, Sudan grass is planted at the rate of from 20 to 25 pounds per acre, regardless of what use is to be made of the crop. Seed is usually cheap, less than 10 cents a pound, so that the cost per acre for seed is comparatively low. Usually, an ordinary grain drill is used for seeding. Most drills can be set for "2 pecks on the wheat side" for seeding Sudan grass. It can be broadcast and covered lightly with a harrow.

Develops Sturdy Roots

Sudan grass grows slowly at first, for it establishes a strong root system before making much top growth. This is the only time that Sudan grass does not compete well with weeds. A seed bed free of weeds, then, is advantageous in getting the crop off to a good start. Like other grasses, Sudan grass needs to be seeded only deep enough to enable it to get in contact with moisture—1 or 2 inches is sufficient. The use of cold, wet soils should be avoided; otherwise, ordinary soils are satisfactory. It is well known that the sorghums are adapted to a wider range of soils than are corn and other leading crops. Lime is rarely needed, but 200 or 300 pounds of superphosphate per acre are often helpful. The only time that Sudan grass needs much moisture is when it is getting started. It often fails, therefore, when planted after the harvest of a crop like oats taken off early. Under these conditions, its success usually depends upon proper moisture conditions.

Can Be Combined

Only rarely is it of value to mix plantings of crops, with the exception, of course, of permanent pastures. Some growers have mixed soybeans and Sudan grass to produce a hay of higher value, due to the legume. When used as a combination crop, these should be drilled together, the grass seed attachment of the drill being used for the Sudan grass. The combination is usually about half-and-half.

Due to its extraordinarily rapid growth, Sudan grass often may be pastured within a month after seeding, and it is not unusual for it to grow a foot or more in from 4 to 6 weeks' time. After the crop is established and has grown to a height of 12 or 15 inches, it should be pastured fairly heavily. Livestock do not like the coarse plants that develop when it is not heavily pastured. Or course, resting the crop by rotating pastures is helpful to Sudan grass as well as to other pasture crops. Ordinarily, an acre will pasture from one to three cows, or an equivalent of sheep, pigs, and horses through the summer and up until the first of October.

Its chief value as a hay crop lies in its great yielding ability. On the other hand, its chief drawback lies in the difficulty growers frequently experience in trying to get the hay cured properly. It should be cut soon after

it heads, and every precaution to insure proper curing should be taken. It is not unusual for growers to lose much of their hay crop due to difficulty in curing the tall, coarse stems, which dry out slowly. But if the crop is cut promptly and cured properly, it will, as stated above, produce a fair quality of hay, equal to, or better than, timothy in feeding value. Also, a second crop, or aftermath, for pasturing is usually obtained.

The hay crop is cut from 8 to 10 weeks after seeding. It is not unusual to get a hay crop in 2 months' time. If rain does not interfere, it takes about 4 days to cure. Most growers leave the crop in the swath for 2 days and in the windrow for 2 days. It need not be turned unless rained on. This procedure appears to be more satisfactory than curing in cocks or cutting with a binder and attempting to cure in shocks.

Use Weed-Free Seed

Some growers save Sudan grass for seed, but this is not of any great importance outside of the great seed-producing areas in the Southwest. As previously stated, seed is cheap, and unless some arrangements can be made before harvest for disposing of the crop there is no particular reason why the average farmer should save a seed crop. As a rule, seed production is a specialty that very few farmers can carry on with great success. Often it is a temptation to save seed, but in the case of most forages this is best left to the grower equipped for seed handling.

In the southern part of the Corn Belt, growers buying Sudan grass seed must be on the lookout for mixtures with Johnson grass, one of the worst weeds in the South. Many growers in northern sections have been lulled into a sense of security against the danger of Johnson grass, feeling that it would not survive the cold winters. In the southern part of the Corn Belt and in protected areas, however, Johnson grass has survived the winters, and in certain regions has become quite troublesome. Sudan grass and Johnson grass are similar in seed and plant characteristics, with the important exception that Johnson grass has underground stems that make it a persistent perennial in warmer areas. Anyone that has had experience with quack grass can appreciate the troubles that Johnson grass can cause in cultivated fields.

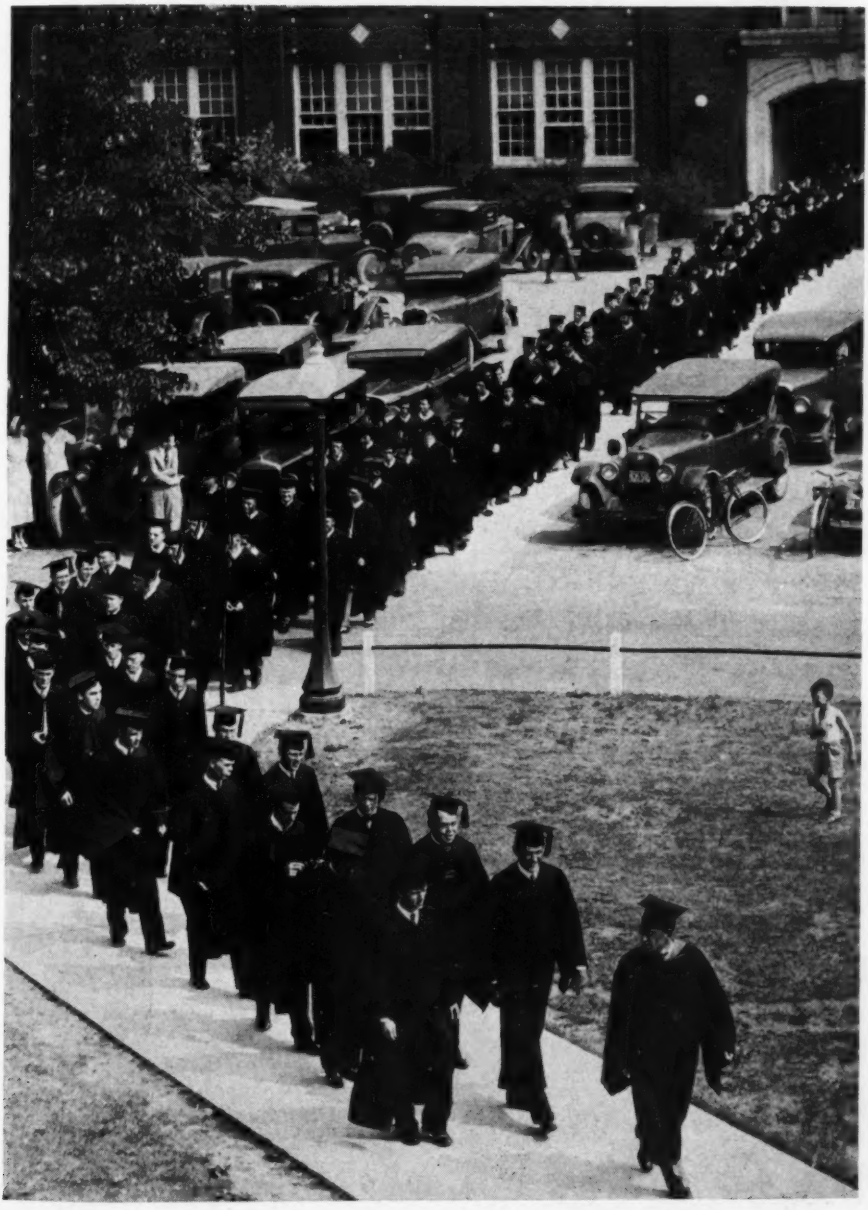
Avoid Acid Poisoning

The last 6 or 7 years have been characterized by unusual weather conditions, and farmers have had to adjust their cropping plans accordingly. This situation has brought Sudan grass into the picture as both an emergency and a regular crop. Many growers rely greatly on Sudan grass, even though they realize that difficulty may be encountered with prussic acid poisoning if the crop is arrested in its growth. It is rather widely known that pasturing Sudan grass that has been severely stunted by either drought or frost should be avoided. This condition presents no serious difficulty, however, since methods for overcoming prussic acid poisoning have been developed. Also, one experiment station has already developed a strain of Sudan grass that does not cause prussic acid poisoning.

Insures Food Supply

No one knows what kind of weather we shall have in 1937—whether there will be droughts, or floods, or combinations of them. Ordinarily, an extremely dry year does not follow a dry year like 1936. Whatever the conditions, a small patch of Sudan grass is something to fall back on, providing additional insurance that livestock of all kinds will have something to eat during the hot months and during the cold months some hay that is "better eating than snowballs."

PICTORIAL



Harvesting America's most important crop—graduates eager to carve for themselves a place in the world beyond college walls.

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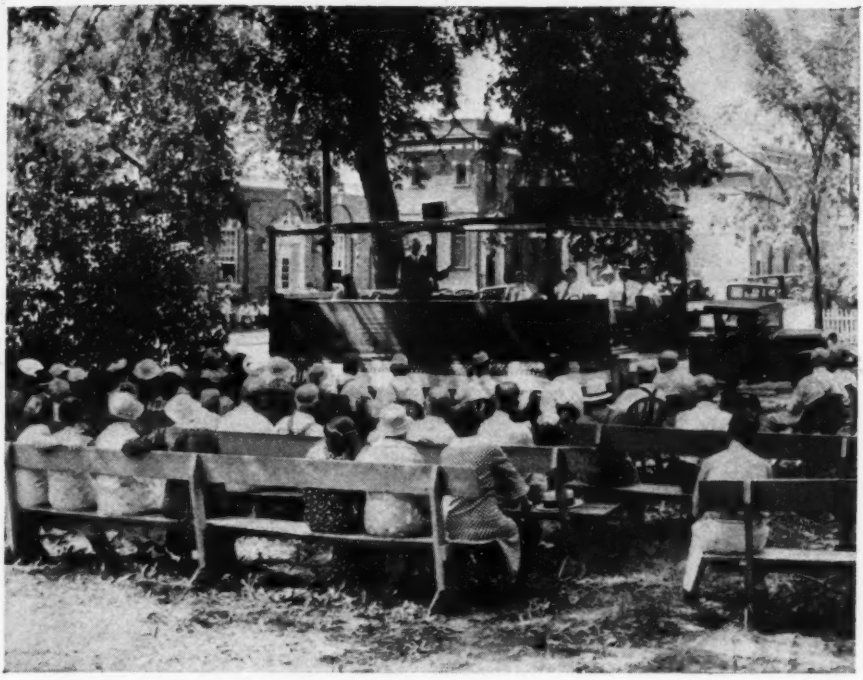

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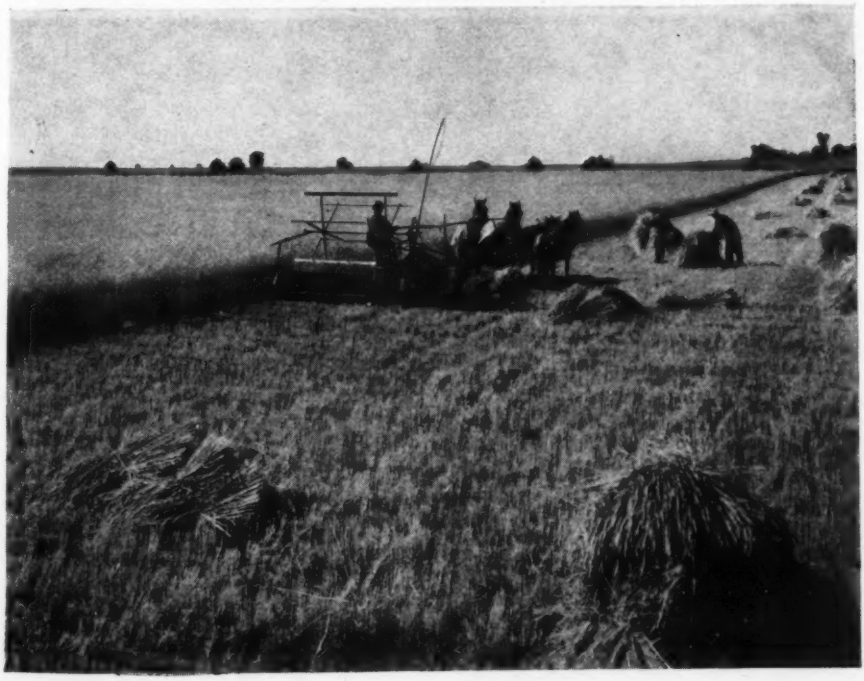

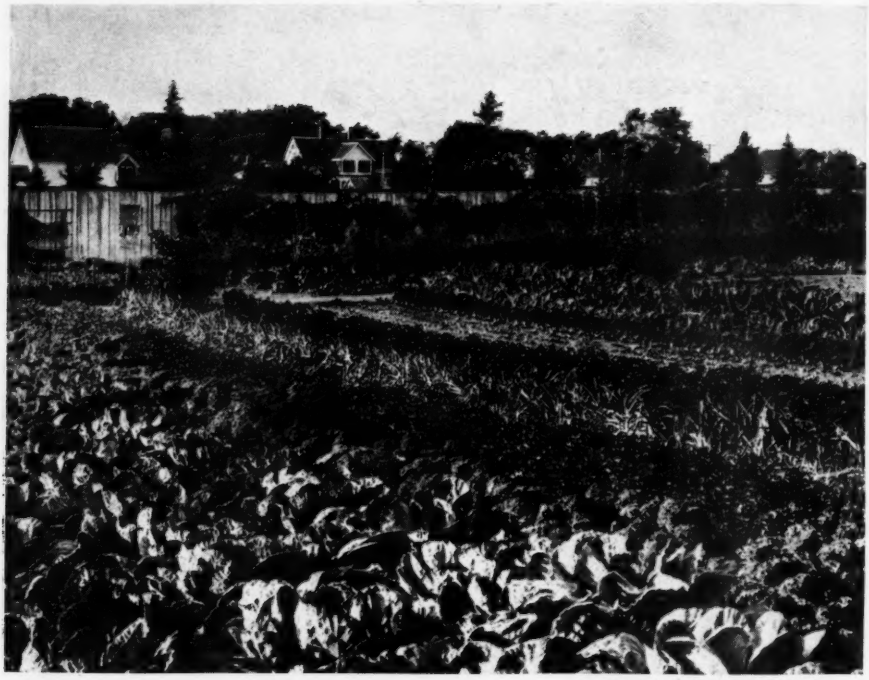

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Above: Many suburban families have gardens that would put their country cousins to shame.
Below: Terraced farm land makes interesting patterns of the countryside.

The Editors Talk

Convene to Cooperate

On June 7-9 at White Sulphur Springs, W. Va., the National Fertilizer Association successfully held their thirteenth annual convention. With a large attendance reflecting satisfactory trade conditions, several highlights of the convention point to the interest within the industry in the problems and activities of allied fields. Personal problems are ever paramount, but when viewpoints are broadened and lengthened to include the problems of others, progress is set in motion.

This concept was borne out in the address of Dr. T. S. Buie of the Soil Conservation Service who in his discussion of the relation of soil and water conservation to the fertilizer industry said, "if you would retain your markets, you must be interested in the maintenance of productive soil—soil sufficiently productive to make the use of fertilizer economically feasible and profitable. To illustrate, Dr. Buie described two South Carolina townships, one located in an area only moderately eroded, the other in a severely eroded area. In the area of moderate erosion 29.7 per cent of the total land had been planted to cotton, but in the other area only 11.8 per cent was in cotton. The difference was not due to diversion to other cash crops. In the first area each square mile produced 108 bales of cotton annually, while the eroded area produced only 35 bales on each square mile. After showing that such an eroded area is a poor sales prospect for the industry, Dr. Buie discussed the importance of fertilizer use in preventing the degeneration of the land to such a condition.

Dr. Henry G. Knight, chief, Bureau of Chemistry and Soils, United States Department of Agriculture, told the assembly that research holds the key to the solution of some of our toughest farm problems. Constructive research in the fertilizer field has lowered the cost of fertilizer to the farmer and has furnished him with a better quality of plant food. Dr. Knight further pointed out that in decreasing the cost of fertilizer mixtures, the present problem is not the production of cheaper fertilizer materials but the formulation of higher analysis mixtures of high efficiency from materials already on the market.

From the agronomic viewpoint presented in the address of Professor T. B. Hutcheson of the Virginia Polytechnic Institute came the opinion that it is unfortunate that legumes ever were called soil-improving or soil-conserving crops, for statements carrying those ideas have convinced many farmers that all they have to do is to plant legumes, take them off clean if they want them, and still have improved soils. An examination of the analyses of a number of crops shows that if the plant food in crops is given the value paid for it in fertilizers, it costs the soil more to grow a crop of legumes than a crop of non-

legumes. If legumes are not inoculated, of course, no benefit is derived from them at all, and even when inoculated they draw heavily upon the mineral resources of the soil. "If we can get our farmers to realize the truthfulness of those statements, we will have made a great stride in agricultural development," Professor Hutcheson stated. "Practical farmers have failed to realize that we cannot continue to grow crops and improve yields unless plant food is returned to the soil in amounts at least equivalent to those removed by crops."

International observation came in the address of G. H. Holford of the Fertilizer Advisory Service, Auckland, New Zealand, who spoke on "Fertilizing Pastures in New Zealand," and showed several reels of colored moving pictures of different parts of New Zealand. The clearly indicated differences between fertilized and unfertilized pastures, particularly as photographed from the air, provided striking evidence of what that country has done to improve its pastoral agriculture. Mr. Holford commented on the fact that, while possibilities for fertilizer use in New Zealand are largely limited to pastures, the appropriations in that country for educational work are much larger in proportion to tonnage sales than is the case in this country where the possibilities of increasing grass fertilization are just becoming realized.

It is good for industries to convene and for groups within industries to get together to discuss problems in common. And whenever in these conventions viewpoints are freshened by outside sources, new inspiration and encouragement result.

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S-O-S Now, in the height of the growing season, is the best time to heed the S-O-S (Signs of Starvation) which plant life makes manifest. Plant-food deficiency symptoms are easily read by those who have learned to recognize them. The spreading of this knowledge among growers is a service which they should welcome and which should realize for them dollars and cents on the information gained.

Not only do plants indicate a general lack of plant food, but many of them reveal the lack of any particular plant food. White spotting around the edges of clover and alfalfa leaves, scorching of leaves of fruit trees, darkened color and crinkling of the leaves of potato plants, firing and scorching of the edges of corn leaves, the appearance of rust on cotton plants—all are easily recognized symptoms of potash deficiency. Likewise, various plants will show their need for nitrogen, phosphoric acid, magnesium, and other essential nutrients.

Although in most cases it is too late to help the crops which are showing starvation this year, these symptoms should be carefully noted and should serve as a guide to the fertilization program for another growing season. They indicate the soil's inability to supply the available plant food. However, long before they appear, yields may be reduced due to supplies of plant food insufficient to maintain crops at their maximum. It is not economical to wait for starvation signs before taking steps to maintain soil fertility at levels which will insure profitable yields.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizing Farm Crops," by J. B. R. Dickey, Pennsylvania Agricultural Leaflet 26 (Revised), is a very informative publication that gives a number of helpful suggestions to farmers of that state on the fertilization of their crops. With reference to higher analysis mixtures, repeated experiments indicate they are at least equal in efficiency to the standard forms when the plant food is applied in equivalent amounts. The higher analysis goods usually are lower in price per unit of plant food. Where the freight rate is high and the labor of hauling and handling burdensome, the higher analysis fertilizers are especially economical. Owing to the higher analysis fertilizers now available, it seems desirable to base recommendations on the best ratio of the three plant-food elements, rather than a definite percentage of each. The 1-2-2 ratio, represented by 4-8-8, 5-10-10, or an 8-16-16, furnishing 160 to 240 pounds of plant food per acre, for example, seems best for potatoes. Recommendations for other field crops based on experiments and good farm practices are listed in a form easily understood. Fertilizing for greatest economic returns, accompanied by crop rotation and the proper application of lime when required, will usually take good care of the soil fertility, the author states.

According to a recent mimeographed publication compiled by the Soils Department of Michigan State College, fertilizer sales as reported by the companies doing business in Michigan totalled 125,693 tons, of which 68,195 tons were sold in the spring and 57,498 tons in the fall. Of special significance are the facts that of the total tonnage 78 per cent was composed of grades or ratios recommended by the Soils Department and that 81 per cent of all the mixed goods sold contained 20 per cent or more of plant food. Out of 79 licensed grades, 10 grades made up 80.5 per cent of the total sales. An increase of 11.5 per cent over last year's total sales is indicated. Especially gratifying is the indicated percentage increase in sales over those of 1935 of 17.2 per cent of 2-12-6, 105.9 per cent of 2-16-8, 40.3 per cent of 4-16-4, 5.6 per cent of 0-20-0, and 20 per cent of 4-16-8, while the sales of 2-12-2 decreased 17.7 per cent. The most important single analysis was 2-12-6, which represented 41.4 per cent of all fertilizer sold in this state in 1936.

"Suggested Fertilizer Recommendations for Indiana," Agr. Exp. Sta., Lafayette, Ind., Unnumbered Mimeographed sheet.

"The Seasonal Course of Soluble Nitrogen and Phosphate Phosphorus in the Shoot Growth of Winesap Apple and Elberta Peach," Agr. Exp. Sta., Lexington, Ky., Bul. 367, C. S. Waltman.

"Fertilizers for Cotton on the Red and Mississippi River Alluvial Soils of Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 284, Apr. 1937, H. C. Lovett and Franklin L. Davis.

"Fertilizers for Cotton on the Coastal Plain Soils of Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 285, Apr. 1937, Franklin L. Davis and H. C. Lovett.

"Fertilizers for Cotton on the Prairie Soils

of Southwest Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 286, Apr. 1937, H. C. Lovett and Franklin L. Davis.

"Strawberry Fertilizer Studies in Maryland," Agr. Exp. Sta., College Park, Md., Bul. 403, Sept. 1936, W. E. Whitehouse and A. L. Schrader.

"Nitrogen and Carbohydrate Content of the Strawberry Plant," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 252, March 1937, J. H. Long and A. E. Murneek.

"Fertilizer Recommendations for New York," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 281, Rev. Apr. 1936.

"Fertilizing the Hop Crop," N. Y. Agr. Exp. Sta., Geneva, N. Y., Mimeographed Progress Report, J. D. Harlan.

Soils

The wide-spread demand for Dr. M. F. Morgan's Bulletin 372 (Connecticut Agricultural Experiment Station) entitled, "The Universal Soil Testing System," exhausted the supply much sooner than was anticipated, therefore, prompting a revised edition of this popular publication as Bulletin 392. A few minor changes and additions in the testing methods and their interpretations have been made in the new publication. The distinguishing characteristic of this scheme of testing is the employment of a highly buffered mixture of acetic acid and sodium acetate for the extraction of the soil sample. All of the significant tests are conducted on portions of this extract; hence great speed and economy of operation are provided.

Detailed instructions on the fundamentals of procuring accurate soil samples, preparing the various chemical reagents, and conducting and interpreting the test are given. Other pertinent factors, such as verifying a case of suspected crop deficiency or nutrient abnormality by means of chemical examination of the plant itself and application of tests to drainage water from soils, are given consideration. The author explains that while soil testing promises to be a valuable contribution to the more intelligent management of the soil in helping to forestall crop failure due to improper fertilization, as well as preventing the wasteful use of unnecessary fertilizer ingredients, the best fertilizer and liming practices cannot overcome the injurious effects of deficient or excessive moisture conditions, improper cultural methods, etc. The grouping of crops with respect to their lime, nitrogen, phosphoric acid, and potash requirements affords a most helpful guide in making fertilizer recommendations.

"Soils of Cascade County. Soil Reconnaissance of Montana, Preliminary Report," Agr. Exp. Sta., Bozeman, Mont., Bul. 337, Mar. 1937, L. F. Gieseker.

"Erosion Control in Ohio Farming," Agr. Ext. Serv., Columbus, Ohio, Bul. 186, D. R. Dodd.

"Soil Conservation Practices in Actual Use by Farmers," Agr. Exp. Sta., Knoxville, Tenn., Monograph No. 28, Feb. 20, 1937, Charles E. Allred and Dalson H. Esry.

"Truck Crop Investigations—Liming Coastal Plain Soils," Truck Exp. Sta., Norfolk, Va., Bul. 91, Apr. 1, 1936, Jackson B. Hester, M. M. Parker, and H. H. Zimmerley.

"Preventing Soil Blowing on the Southern Great Plains," U. S. D. A., Washington, D. C., Farmers' Bul. 1771, Mar. 1937, E. F. Chilcott.

"Trace Elements in the Soils from the Erosion Experiment Stations, with Supplementary Data on Other Soils," U. S. D. A., Washington, D. C., Tech. Bul. 552, Jan. 1937, C. S. Slater, R. S. Holmes, and H. G. Byers.

Crops

According to Minnesota Agricultural Extension Special Bulletin 182, entitled "Potato Pointers," by A. G. Tolaas, plenty of plant food must be available to obtain a good crop of well-shaped potatoes. The author points out that both phosphorus and potash are very essential to the production of high-quality potatoes. Although plowing under certain crops and applying barnyard manure supply considerable amounts of plant food, particularly nitrogen, more phosphoric acid and potash are required in proportion to the nitrogen supplied by these practices. The deficiency of both these elements may be supplied through commercial fertilizer mixtures. Since turning under legumes and applying

barnyard manure make soils hold moisture better, fields so treated give better results from commercial fertilizers than fields on which grain preceded potatoes. The bulletin suggests that fertilizer be placed on the level with the seed piece or slightly below it in bands 2 inches away to obtain best results and insure against fertilizer injury. A considerable section of this interesting publication is devoted to the selection of varieties to grow. In addition to describing the characteristics of the different potato varieties grown in the state, photographs portraying their typical shapes and other features contribute much to making this a very attractive and useful publication. Among the other points discussed are crop rotation, soil preparation, planting, cultivating the crop, and controlling insects and disease.

"Producing Spinach and Other Leafy Vegetables for Market," Agr. Ext. Serv., Little Rock, Ark., Cir. 190, *Rev. June* 1936, *Claude Woolsey.*

"The Family Vegetable Garden," Agr. Ext. Serv., Little Rock, Ark., Cir. 304, *Rev. June* 1936, *Claude Woolsey.*

"Propagation of Grapevines," Agr. Ext. Serv., Berkeley, Calif., Cir. 101, *Nov.* 1936, *H. E. Jacob.*

"Almond Culture in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 103, *Jan.* 1937, *Milo N. Wood.*

"Tobacco Substation at Windsor, Report for 1936," *Agr. Exp. Sta., New Haven, Conn., Bul.* 391, *Jan.* 1937, *P. J. Anderson, T. R. Swanback, and O. E. Street.*

"Grape Culture in Georgia," Agr. Ext. Serv., Athens, Ga., Cir. 265, *Dec.* 1936, *Dr. T. H. McHatton.*

"Report of the Director, July 1, 1935 *to June* 30, 1936," *Agr. Ext. Serv., Lafayette, Ind., J. H. Skinner, Director.*

"Strawberries for Home and Market," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. 174, *Rev. Oct.* 1936, *Monroe McCowan and Clarence E. Baker.*

"Biennial Report of the Rice Experiment Station, Crowley, Louisiana, 1935-1936," *Agr. Exp. Sta., Baton Rouge, La., J. Mitchell Jenkins, Supt.*

"Crops and Soils Information," Agr. Exp. Sta., Baton Rouge, La., Bul. 283, *Mar.* 1937.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Serv., Amherst, Mass., Vol. 1, *No.* 4, *May* 1937.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 19, *No.* 4, *May* 1937.

"Garden Beans," Agr. Exp. Sta., Columbia, Mo., Cir. 195, *May* 1937, *C. G. Vinson.*

"The Effect of Tillage Method, Crop Sequence, and Date of Seeding Upon the Yield and Quality of Cereals and Other Crops Grown Under Dry-Land Conditions in North-Central Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 336, *Feb.* 1937, *M. A. Bell.*

"Fiftieth Annual Report of the Agricultural Experiment Station of Nebraska," Agr. Exp. Sta., Lincoln, Nebr., W. W. Burr, Director.

"Should More Jerusalem Artichokes Be Grown?" Agr. Ext. Serv., Lincoln, Nebr., Cir. 108, 1937, *T. A. Kiesselbach.*

"Stored Moisture Assures Potato Crop for Western Dry Land," Agr. Ext. Serv., Lincoln, Nebr., Cir. 1215, 1937, *H. O. Werner.*

"Forty-seventh Annual Report, 1935-1936," *Agr. Exp. Sta., State College, N. M., Fabian Garcia, Director.*

"Dry-Land Crops at the Tucumcari Field Station," Agr. Exp. Sta., State College, N. M., Bul. 244, *Nov.* 1936, *Donald R. Burnham and John S. Cole.*

"Report of the North Carolina Department of Agriculture from July 1, 1934 *to June* 30, 1936," *St. Dept. of Agr., Raleigh, N. C., Wm. A. Graham, Comm.*

"Important Factors in Cotton Growing in North Carolina," Agr. Exp. Sta., Raleigh, N. C., Agron. Inf. Cir. 106, *Mar.* 1937, *P. H. Kime.*

"Fifty-fifth Annual Report, 1935-1936," *Agr. Exp. Sta., Wooster, Ohio, Bul.* 579, *Mar.* 1937, *C. G. Williams, Director.*

"How Water, Organic Matter, and Rotations Contribute to Sugar Beet Yields" and "Fertilizing Ohio Soils for Sugar Beets," Agr. Ext. Serv., Columbus, Ohio, Unnumbered Mimeograph, Mar. 27, 1937, *E. P. Reed and John A. Slipher.*

"Serving the Farm and Home Interests of Oregon, 1934-1936," *Agr. Ext. Serv., Corvallis, Oreg., Bul.* 493, *No.* 1936, *Frank L. Ballard.*

"Report of the Department of Agriculture, April 1, 1935, *to December* 31, 1936," *St. Dept. of Agr., Salem., Oreg., S. T. White, Director.*

"Soybeans," Agr. Ext. Serv., Clemson College, S. C., Bul. 76, *Rev. June* 1936, *R. W. Hamilton.*

"Annual Report of the South Dakota Agricultural Experiment Station for the Fiscal Year Ending June 30, 1936," *Agr. Exp. Sta., Brookings, S. Dak., James W. Wilson, Director.*

"Forty-ninth Annual Report, 1936," *Agr. Exp. Sta., Knoxville, Tenn., C. A. Mooers, Director.*

"Eighth Biennial Report of the Utah State Board of Agriculture," July 1, 1934, *to June* 30, 1936, *State Dept. of Agr., Salt Lake City, Utah, David F. Smith, Comm.*

"Growing Timber on the Vermont Farm,"

Agr. Ext. Serv., Burlington, Vt., Cir. 90, June 1936, George W. C. Turner.

"Hints on Flower Gardening," Agr. Ext. Serv., Burlington, Vt., Cir. 92, Mar. 1937, Charlotte Pierpont Brooks.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 348, May 1937.

"Findings in Farm Science," Agr. Exp. Sta., Madison, Wis., Bul. 438 (An. Rpt. of Dir., 1935-36), Mar. 1937, Chris L. Christensen, Director.

"Crop Rotation and Tillage Experiments at the Northern Great Plains Field Station, Mandan, N. Dak.," U. S. D. A., Washington, D. C., Tech. Bul. 536, Dec. 1936, J. T. Sarvis and J. C. Thysell.

"Wheat in the United States," U. S. D. A., Washington, D. C., G-68, Gen. Inf. Series, Apr. 1937.

"High-grade Timothy and Clover Hay—Methods of Producing, Baling, and Loading for Market," U. S. D. A., Washington, D. C., Farmers' Bul. 1770, Feb. 1937, E. O. Pollock and W. H. Hosterman.

Economics

The activities of the County Agricultural Planning Committees of Iowa are summarized by Herbert G. Folken in Iowa Extension Circular No. 233, "County Land Use Planning by Iowa Farmers." Believing, as they do, that the problem of land planning should be approached from the community standpoint, groups of farmers ranging from 15 to 30 in number in each Iowa county began in the fall of 1935 to study the use to which the agricultural resources of their county were being put, to attempt to evolve a type of agriculture that would be more desirable for their county, and to outline the practices essential to a permanent agricultural conservation program.

In former years when foreign markets were taking increasing volumes of farm products, worn-out farms were being abandoned, and new ones purchased at very low prices in rich undeveloped areas, industry was expanding with sufficient rapidity to absorb the surplus farm population. Few people were concerned about the conservation of our agricultural land.

Following the World War and the depression of 1930, there appeared significant changes. All of the available fertile land had been brought into cultivation, productivity of the older soils was decreasing, pastures had been plowed up to be turned into crop land, and wet areas within farms had been made more productive through drainage. There had been a steady increase in the abandoned acreage of farm land. All of these factors changed the problems of agricultural production. From the consumption standpoint a substantial part of the foreign market for farm products had been lost and the prospects for the reestablishment of these markets was slight. The domestic market for farm commodities had also undergone important changes. Population was not increasing as rapidly as formerly and the American mode of living was changing. As a consequence, the requirement for energy-producing food was less. Since 1929, the movement of farm people to cities has been greatly reduced due to the difficulties of finding a ready place in industry.

In Iowa especially, the pattern of farm tenure and occupancy has changed. The proportion of the capital value of farm land owned by the operator has been shrinking, first due to extended use of credit by operators to acquire or to expand their holdings and then to the subjection of farms to foreclosure. At the present time one-half of the farm families in Iowa are tenants and three-fifths of the farm land is rented.

With the above facts in mind the committees set themselves to the task of, first, taking an inventory of the farm resources and, second, recommending certain adjustments which they consider desirable for their communities. They used as a basis the cropping practices which they observed on typical farms, the crop acreages which have prevailed in the county, and the studies and research reports of the Experiment Station per-

taining to the agricultural resources of the particular county.

In general, the committees set up four classes of land use based on the conserving or depleting effect of the use on the land. These classes were: (1) permanent vegetation, (2) rotated grassland, (3) small grains, (4) intertilled crops.

For the state as a whole, the committees recommended that 23 per cent of all lands in farms should be in the form of permanent vegetation. Approximately 5 per cent is occupied by roads, lots, buildings, etc. Thus, 72 per cent of all land in farms was considered suitable for cultivation as rotated land. The proportion of all land in farms recommended for each of these uses ranged from 18 per cent in permanent vegetation, 18 per cent in rotated grass, 26 per cent small grain, and 38 per cent in intertilled crops in farming type area 4 in central Iowa, to 46 per cent in permanent vegetation, 20 per cent in rotated grass, 15 per cent in small grains, and 19 per cent in intertilled crops in area 7 in southeastern Iowa. The recommendations of the committees depended upon the topography of the soil, the relative absorbing capacity of the subsoil, the depth and type of topsoil, and the general productivity of the area.

The rotations which the county committees selected as being the most desirable for the various soil groups placed 42 per cent of the rotated land of the state into intertilled crops, 29 per cent into small grain, and 29 per cent into grassland. It is interesting to note that the small grain acreage recommended by the committees is 4 per cent smaller than the 1929 acreage harvested. A 27 per cent increase over 1929 of all tame hay acreage, exclusive of soybean hay, was recommended. This included an alfalfa acreage more than twice that of 1929 with a slightly decreased acreage of other types of tame hay. The recommended total pasture acreage is 9 per cent larger than that of 1929.

The recommended intertilled acreage is about 8 per cent smaller than the 1935 harvested acreage, with about a 3 per cent decrease for corn, about 56 per cent for soybeans, and about 1 per cent for other intertilled crops. The recommended small grain acreage is 3 per cent smaller than that harvested in 1935.

A great variety of factors entered into the recommended changes in livestock production. Among such factors are the prices of various kinds of livestock in relation to each other and in relation to the prices of various kinds of feeds. The committees, however, did indicate that with a smaller corn acreage and more roughage there would probably be an increase in cattle and sheep and a decrease in hog production.

Problems which will be taken up in the future by the county committees are: (1) The adaptation of livestock enterprises to the soil conservation program, (2) the relation of soil conservation to production control, (3) farm tenure, and (4) measures for effecting conservation on individual farms.

"Economic Digest," Conn. St. Col., Storrs, Conn., No. 68, Apr. 1937.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 22 and 23, Mar. and Apr. 1937.

"Production Requirements and Costs on Irrigated Farms in Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 338, Apr. 1937, *P. L. Slagsvold and Clyde Howard.*

"Seventh Annual Report of the New Mexico Feed and Fertilizer Control Office for Year Ending December 31, 1936," N. M. Feed and Fert. Control Office, State College, N. M., Mar. 15, 1937, *R. W. Ludwick and Lewis T. Elliott.*

"Fertilizer Consumption by Counties in New Mexico," N. M. Feed and Fert. Control Office, State College, N. M., Unnumbered Mimeograph, Jan. 1, 1936 to Dec. 31, 1936.

"Fertilizers Sold in North Carolina from July 1, 1936, to Dec. 31, 1936," N. C. Dept. of Agr., Raleigh, N. C., Unnumbered Mimeo.

"Types of Farming in Utah," Agr. Exp. Sta., Logan, Utah, Bul. 275, Nov. 1936, *Marion Clawson, Walter U. Fuhriman, George T. Blanch, and W. Preston Thomas.*

Hybrid Corn Won't Yield Well Without Good Soil

SEED CORN may be too good for the land it is planted in. Or, as A. L. Lang, Illinois Agricultural Experiment Station soils specialist says, "Hybrid corn cannot be expected to take the backache out of hauling limestone nor remove the pain when it is necessary to extract money from the family purse for potash and phosphate."

A corn grower cannot expect to grow 90-bushel or 100-bushel corn on 30-bushel land, and he may be wasting high quality seed if he tries it. On the other hand if he has high quality soil capable of yielding big crops, he is wasteful if he does not buy seed good enough to make full use of the land. Practical tests have shown over and over again that good hybrid seed corn well adapted to the soil and the climate will yield enough more grain to return many times the extra investment in seed.

How the seed should fit the land and the land should fit the seed has been revealed clearly in plantings in Illinois, say agrononomists of the United States Department of Agriculture who have been cooperating in this corn work. In comparing yields from the best five varieties of hybrid corn with the yields from the best five open-pollinated varieties, tests were made on fields of varying fertility. On the least fertile fields, the hybrids outyielded the open-pollinated varieties by only 5 bushels to the acre, but on the most fertile fields there was a difference of 24 bushels to the acre in favor of the hybrid corn.

One good feature of corn improvement by hybrid breeding, Lang points out, is that superior hybrids may make it possible to obtain much larger returns from good systems of soil improvement than has been possible in the past. In other words, a farmer need no longer fear that he is getting his land too good for his seed.

Nutrient Requirements For Good Barley

THE importance of nitrogen, phosphoric acid, and potash in the growth of barley is shown in experiments reported by F. G. Gregory and E. C. D. Baptiste of the Imperial College of Science and Technology, London, in the July, 1936, issue of the Annals of Botany. They grew barley with various treatments ranging from a complete fertilizer to other combinations in which nitrogen, phosphoric acid, or potash each were omitted. They found that plants deficient in one of these nutriments showed certain definite types of growth which might be described as hunger signs for those particular nutrients. They state that the nitrogen-deficient plants were much reduced in size with much less tillering and that the younger leaves were smaller in size and pale green in color. Phosphorus-deficient plants showed a typical red coloration of the leaves with the exception of the youngest leaves which were more normal in appearance. The potash-starved plants had light green, succulent leaves, especially in the case of the younger ones. These plants tillered freely and

the individual leaves died rapidly. Potash-deficient plants were also characterized by standard stems and failure to produce a head. Nitrogen and phosphorus-deficient plants produced their leaves much more slowly than did the completely fertilized plants or those lacking potash.

The lack of any of the nutrients affected the function of the plant in a way that would have a very important effect on the quality and therefore the value of the crop. When nitrogen was lacking, the production of protein was reduced 52 per cent from that of the completely fertilized plants. A lack of phosphorus reduced protein production 21 per cent, and a lack of potash reduced it 32 per cent. These data refer to the protein content of the leaves only. The sugar content of the leaves was increased when nitrogen was lacking but decreased to some extent when phosphorus was lacking, and decreased to a larger degree when potash was lacking. The effect of the lack of various nutrient on grain composition is not given by the authors, but there is every reason to believe that disturbances in the normal functioning of the leaves would exert an unfavorable influence on the quality of the grain produced.

Survey Seeks to Cut Market-Basket Costs

THE major portion of the housewife's dollar for fruits and vegetables goes to pay the distribution costs from the farm to the consumer.

One of the greatest possibilities for reducing these costs, as well as increasing prices received by farmers for these commodities, appears to be the improvement of wholesale and jobbing markets which handle the fruits and vegetables before they reach the consumer.

Improvement in wholesale and jobbing markets in cities, the purpose behind a series of studies of the larger city fruit and vegetable markets now being made by the Bureau of Agricultural Economics, should increase the purchasing power of the housewife's dollar.

In many large cities, the fruit and vegetable market has grown like Topsy—mainly without any coordinated plan. In some cities facilities are out of date. Where new markets have been built, many have not been carefully designed; in some cases they have been established for the benefit of certain elements of the trade or individual railroads rather than with any definite plan for bringing about efficiency in marketing and distribution.

The Bureau already has published a report of its study of the Philadelphia wholesale fruit and vegetable market and is now extending its survey into 39 other principal cities of the United States. A committee representing carlot receivers in Philadelphia has been appointed to study the report for that city and to make recommendations to the trade. Another committee representing several farm organizations in New Jersey is studying the report to see if it supplies the answers to some of the distribution problems in that state. Several meetings of farmers have been arranged in New Jersey and Pennsylvania to discuss the report.

The purpose of the present Bureau surveys in 39 cities is to get the essential facts about the location of facilities, amount of business done, total cross-hauling between markets, rela-

tive importance of rail and truck receipts, prevailing charges for trucking and commissions, and the principal regulations governing marketing practices and methods. More detailed studies will be made later in several cities.

The need for improving wholesale fruit and vegetable markets of large cities has been emphasized in recent years by changed conditions and methods of marketing and distribution.

Changes in buying habits of consumers, increased marketing costs, and development of motor-truck transportation and chain-store methods of purchase and sale—all have affected the wholesale fruit and vegetable markets. With these changing conditions there has come a growing feeling among growers, consumers, and members of the trade that better markets are necessary to the welfare of both the farmer and the consumer.

It Takes 30 to 40 Leaves To Produce a Good Peach

HOW many leaves are required to produce enough food to develop a good peach? Experiments by the United States Department of Agriculture indicate at least 30 to 40 leaves are necessary. Forty to fifty leaves are required to develop a good-sized apple, and about 50 for an orange.

Producers of large peaches provide larger leaf areas—more than 40 leaves per peach—by thinning the fruit closely. This permits the peaches left on the tree to get more food from the leaves. When the fruit set is light for the entire tree—but perhaps heavy on certain branches and the leaves plentiful—the fruit may be left unthinned.

After a damaging freeze fruit may set only at the base of the shoots. When this occurs the leaves on the bearing and nonbearing shoots will under favorable conditions produce peaches of good size and quality although the fruit may be only a few inches apart. Leaves far away from the fruit and those on the nonbearing shoots also help to manufacture food.

Hope To Grow Melons To Fit Average Icebox

A WATERMELON to fit the average refrigerator is something which the United States Department of Agriculture hopes to develop in its new vegetable breeding laboratory near Charleston, S. C.

There is a place, the Bureau of Plant Industry recognizes, for enormous melons that grow in size like fish stories of the one that got away. But the huge melons are unsuited for consumers who cannot chill them whole.

A melon is too large if the family cannot consume most of it at a single slicing. It is too large if it is necessary to cut it to get it into the refrigerator, for a melon cut before it is chilled loses quality.

Other qualities desired in watermelons are: A tough (but not thick) rind for shipping, disease resistance, and, of course, delicious flavor. Seed of melons from Asia and Africa may contribute some of these qualities, but for flavor breeders know no melons better than the best of the American varieties.

Too Much Cultivation Cuts Sugar-Beet Yield

AS with potatoes, corn, cotton, and several other crops, cultivating sugar beets oftener than necessary for weed control probably does not pay. It may even damage the crop during dry weather, says the United States Department of Agriculture.

Many beet growers reduce yields by cultivating deeply to "bring up the moisture." Tests by the Department and the Colorado Experiment Station show deep cultivation prunes the beet

roots and allows soil moisture to evaporate easily. Beets around which the soil was scraped once during the season with a hoe for weed control produced just as many tons in the tests as those cultivated one to seven times. Close and consistent row tillage in another test reduced the yield 12 per cent. The Department recommends cultivating beets after heavy rains or irrigation early in the season to keep the soil from forming a heavy crust and to control weeds.

Investigations by the Department indicate that excessive cultivation may harm other growing crops. In a 3-year test at Presque Isle, Me., potatoes cultivated once yield slightly more on an average than those cultivated five times. In Illinois and Nebraska tests showed that cultivating corn oftener than necessary for weed control does not pay the grower for the extra work. Similar results have been obtained with cotton.

The Role of Potash in California Soils

(*From page* 18)

soil types with the lowest readings follow:

On the other hand Ramona loam soil is one which under intensive cropping to barley and tomatoes has not shown evidence of becoming exhausted, and produced satisfactory crops over a long period even though the initial reading for potassium was much lower than the Aiken clay soil. Quite evidently there is some mineral fraction in this Ramona loam soil which is capable of continuously giving up its potassium in sufficient quantity for satisfactory development of the barley and tomato plants.

Locality	Soil type	Mgs. K_2O per 100 gms. soil	
		Surface	Subsoil
Santa Clara Valley	Pinole loam	4	8
" " "	Rincon loam	3	1
" " "	San Ysidro silty loam	11	5
Napa-Sonoma	Laguna loam	5	7
" "	Goldridge fine sandy loam	1	0
" "	Fresno loam	2	11
" "	Madera loam	6	6
" "	Corning gravelly loam	9	10
" "	Tehama loam	12	8
" "	Altamount silty clay loam	6	1
Salinas-Watsonville	Pajaro heavy silt loam	17	12
" "	Chualar sandy loam	14	4
" "	Antioch fine sandy loam	7	1
Oakdale	Oakdale sandy loam	4	4
Hayward	Yolo loam	8	6

Turning to the subject of the soils' supplying power for potassium, we find this may vary greatly. As mentioned previously, one soil with a fairly high reading may become exhausted by intensive cropping for a period of years, while another soil with only a medium reading may produce satisfactory crops indefinitely.

Aiken clay is a soil which according to D. R. Hoagland, of the California Experiment Station, shows a fairly good potassium level, but may readily become exhausted of potassium under intensive cropping practice. After 4 or 5 years of intensive cropping to barley and tomatoes these crops suddenly failed on Aiken clay soil.

To get information of this kind on our soils is a long, tedius task, but it is of utmost importance to a better knowledge of the use of potash on our soils. Not only would it explain the lack of response from potash fertilizers

on some of our soils, but it would likewise tell us upon which soils potassium levels are readily lowered by cropping, so that we might guard against serious deficiencies.

Certain soils in California have what is termed a fixing power for potassium. This simply means that a certain mineral fraction of the soil has such a strong affinity for the potassium ion that if potassium is added, a large proportion of it becomes fixed in a form very slowly available to the plant. This condition exists in an aggravated form in the Farwell loam, Vina clay, and Elder silt loam soils in the Northern Sacramento Valley. Fixing power seems to be a property not related to the level of available potassium in the soil. We cannot say that low-potassium soils have a high fixing power or high-potassium soils have a low fixing power.

FIXING POWER OF SOILS FOR K*

Soil type	PPM replaceable K	K added to soil	Per cent K fixed
Delhi sand	115	68	47
Fresno fine sandy loam	140	321	61
Oakdale sandy loam	175	155	63
Goldridge fine sandy loam	55	212	75
Aiken clay	270	264	84
Vina clay	395	390	93
Farwell loam	85	385	96
Elder silty loam	125	215	99

* Data selected from article by Hoagland and Martin in "Soil Science," Volume 36, No. 1, July 1933.

Soils Vary in Fixing Power

Some California soils studied in regard to their fixing power for potassium appear in the above table which shows the replaceable potassium reading of the soil, potassium added to the soil, and percentage of potassium fixed.

It is apparent from this study of a relatively few California soils that fixing power for potassium varies widely in different soils, and it cannot be said to preclude potash response on all soils. It is certainly a factor to be considered however. This has been proven by the work of O. Lilleland, of the California Experiment Station, in the case of the soils mentioned in the Northern Sacramento Valley. Prune trees growing on these soils exhibit severe die-back symptoms apparently because of a lack of available potash, but because of soil fixing, applications of potash have thus far failed to permanently cure the trouble.

Fixation is most serious where deep rooted crops, such as trees, are concerned. Shallow rooted annual crops feed mostly in the surface soil where potassium accumulates, and their root systems can make the best use of it.

There is some indication that animal manures and green manures help make potash more effective on soils of high fixing power. Later research may arrive at some combination of materials with potash which will overcome fixing power, or at least slow down the fixing process so that the potassium will have a chance to penetrate to soil depths below the surface 8 to 10 inches.

Up to the present time the most promising means of making potash applications more effective on soils of high fixing power seems to lie in method of application. Methods of fertilizer application are receiving an increasing amount of much deserved attention, and without doubt have a direct relation to potassium fixation.

In order to guard against potassium fixation on soils of high fixing power it is unquestionably best to concen-

trate the applications of potash fertilizers in furrows rather than make broadcast applications. Broadcasting the fertilizer over a large part of the surface soil furnishes just the distribution favorable to a high percentage of fixation. Concentrating the fertilizer in a furrow, however, where it comes in contact with a much reduced soil area, allows a higher percentage of the potash to go into the soil solution in the vicinity of the fertilizer, thus becoming available to the plant roots.

The Best Method

Placement of fertilizer in ribbons or furrows is of course coming to be widely accepted as the best method for row crops, and its more extensive practice only waits upon distributing machines which will adapt the method to various crops.

In most orchard districts, except where an extensive surface feeding root system has been encouraged, it is doubtful that the tree can make much use of the accumulations of plant food in the surface 6 to 8 inches. Broadcast applications, distributing the fertilizer over a large surface area, are simply adding to surface accumulations, and if the soil has a high fixing power, phosphorus and potash applied in this way may never do the tree much good.

The adaptation of the furrow method of fertilizer application in orchards would seem to be a long step ahead of the broadcast application where potassium and phosphorus are concerned. This method would minimize fixation difficulties where these are serious, and would enable the tree to get at least some of the applied potassium and phosphorus.

It is not meant by this dicsussion to convey the idea that the relations of potash to California soils are hopelessly complex ones. We have soils which show low levels of potassium, we have soils which quite evidently are becoming exhausted of their potassium, we have soils which vary widely in fixing power for potassium, meaning that fixing power is not by any means a blanket argument for not applying potash, and lastly we have soils which respond to applications of potash.

As our survey of available potash in California soils progresses, as we become more familiar with potash deficiency symptoms and potash response in the great variety of crops with which we have to deal, and as we are able to correlate chemical soil information with plant behavior, there appears to be no reason why potash should not assume a place of steadily increasing usefulness on the farms of the state.

Controlling Soil Erosion in Northern States

(*From page* 11)

6. Seeding rye or other cover in intertilled crops wherever feasible affords some winter and early spring protection.

7. Avoiding the formation of wheeltracks or other depressions on slopes is essential. Paths made by animals up and down pasture slopes usually lead to gullying. Open furrows in connection with the turnrow along fences or field divisions and dead furrows often develop into bad gullies which are more easily prevented than cured.

8. Leaving grass or seeding it in waterways aids in the prevention of gully formation.

9. Making contour furrows or level terraces for holding water on pastures, meadows, or newly-reforested

areas aids in erosion control. These devices conserve much water and are of special value in the drier areas.

10. Filling small gullies in cultivated fields by means of grasses, clovers, or other vegetation, such as shrubs and trees, is feasible. Such vegetation holds soil washed in from adjacent plowed land and eventually fills the gullies. Straw or brush, or both, staked down in gullies checks erosion and helps vegetation to complete its control. Any reduction in the velocity of water causes deposition of silt, sand, and stones. Large gullies often require more extensive control measures, such as ditches for diverting water away from the gullies and check dams, of logs, stones, concrete, or paving, but these structures may well be avoided in cultivated fields wherever simpler means of control are effective.

11. The control of wind erosion may be accomplished by maintaining high productivity, a good supply of active organic matter in the soil, and a live vegetative cover on the soil; by keeping the surface of cultivated land rough; and by conducting tillage and seeding operations in general at right angles to the direction of prevailing winds. In areas of severe wind action seeding crops across the main rows occasionally gives additional protection when the direction of the wind changes.

Replace Plant Food Losses in Crops

(*From page* 13)

In a soil with a large reserve of any one plant food it is logical to "farm out" and deplete that plant food asset in crop production, provided the available plant food is not depleted to a point where subsequent crop yields are lowered. Where a soil already has a low reserve of available potash, the use of legume hay crops will soon cause a shortage of this nutrient. This is what had happened on the Wooldridge farm. Where soybeans or alfalfa are harvested for hay, liberal applications of phosphate-potash fertilizers to the grain and legume seedings will increase the legume hay yields and also maintain the productivity balance of the soil.

In a soil where the limiting factor is nitrogen or organic matter, continuous legume culture will improve the fertility for a time, until the lack of available phosphates or potash becomes the next limiting element. The old theory that a lime-legume-phosphate program of soil management will make potash available fast enough for crop needs has been definitely discarded by most agricultural authorities. In fact, the addition of any one fertilizer material or treatment which increases yields of crops, automatically increases the demands for the

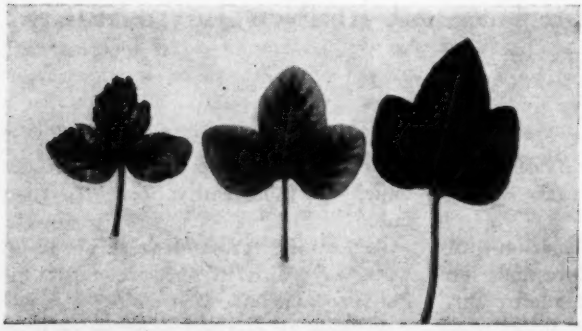


Fig. 3—Left: Potash-starved leaf, crinkled, yellowish, with brown marginal firing. Center: Potash-hungry leaf, yellowing of outer margins. Right: Normal, green, soybean leaf.

other plant foods. Therefore, one must be on the lookout for deficiencies which may develop in a soil as a result of crop removals.

Constant checking on the available plant foods, by soil tests and observations of plant symptoms, enables one to start using proper fertilizers before yields are retarded too much by extreme deficiencies.

PLANT-FOOD LOSSES IN CROPS AND EQUIVALENT AMOUNTS OF FERTILIZERS

Crop Yields per Acre	Plant Foods Removed by Crops		Fertilizers per Acre Required to Equal the Plant Foods Removed by Crops
	Phosphoric Acid (P_2O_5) Lbs.	Potash (K_2O) Lbs.	
Alfalfa—3 T.	32.4	133.8	405 lbs. 0-8-33
Red clover—2 T.	15.6	65.2	195 lbs. 0-8-33.4
Soybean hay—2.5 T.	34.0	116.5	425 lbs. 0-8-27.4
Timothy—2 T.	12.4	54.4	155 lbs. 0-8-35
Reed Canary grass—4 T.	41.6	151.2	520 lbs. 0-8-29.1
Corn—60 bus. ears	23.2	13.4	
2.5 T. stover	22.5	64.5	
Total crop	45.7	77.9	571 lbs. 0-8-13.6
Wheat—30 bus. grain	15.3	9.0	
1.5 T. straw	3.9	22.2	
Total crop	19.2	31.2	240 lbs. 0-8-13
Barley—50 bus. grain	20.5	18.0	
1.5 T. straw	5.4	36.0	
Total crop	25.9	54.0	324 lbs. 0-8-16.6
Oats—60 bus. grain	15.6	10.8	
1.5 T. straw	6.3	45.0	
Total crop	21.9	55.8	274 lbs. 0-8-20.4
Potatoes—300 bus. tubers	21.6	95.4	270 lbs. 0-8-35.3
Onions—800 bus. bulbs	40.3	98.6	504 lbs. 0-8-19.6
Tomatoes—10 T.	14.0	70.0	175 lbs. 0-8-40
Cabbage—20 T.	28.0	116.0	350 lbs. 0-8-33.1
Celery—25 T.	100.0	375.0	1,250 lbs. 0-8-30
Carrots—20 T.	44.0	108.0	550 lbs. 0-8-19.6
Table beets—12 T.	24.0	204.0	300 lbs. 0-8-68
Sugar beets—14 T. roots	22.4	89.6	
8 T. tops	16.0	102.4	
Total crop	38.4	192.0	480 lbs. 0-8-40
Tobacco—1,500 lbs. leaves	12.4	80.8	155 lbs. 0-8-52

Weeds Are "Sissies"—Treat Them as Such

(*From page* 16)

carried over into the second crop season.

Various applications of ammonium sulphate were made. On some plots it was put on at the rate of 100 pounds to the acre, while other applications were as much as 600 pounds to the acre.

"The quack grew fast and furious," relates Dexter. "We were able to cut more than 2 tons of good green hay to the acre before the field was plowed and put into potatoes. That quack just tried to sprout itself to death, apparently. That same year there was plenty of quack in the field and portions of it again looked more like meadow than field, but the potato crop from an additional application of 400 pounds of 4-16-4 fertilizer was fairly good and ran around 130 bushels to the acre.

"As soon as the potatoes were dug, which stirred up the quack roots considerable, a field cultivator was put to work and we kicked the roots around as much as possible. In the spring the field was deep plowed and another

potato planting put in the field and fertilized.

"That treatment certainly worked, for in 1936 we had a clean field with only a few spears of quack showing. The year was dry but the potatoes had no competition and yielded about 180 bushels to the acre."

What happened was this, according to Dexter's explanation. By stimulating the quack grass, the weed was encouraged to give up its time and energy into producing as much top growth as possible and to neglect its usual sturdiness in roots and rhizomes. When it was kicked around in the fall it was unprepared for wintering. Roots lying on the surface or near the soil surface "just couldn't take it." It was just like a bear trying to hibernate without remembering to prepare himself with his usual layers of fat for winter protection. The process is to be repeated in 1937 to determine the most practical method of obtaining the results.

Plans Future Work

Now Dexter has transferred some of his study to the Canada thistle and the bindweeds that have taken out of profitable operation some of the most fertile lands in the state. These weeds are remarkably tender when exposed to temperatures not very far below freezing. At 6 to 8 degrees Centigrade, or around 22 degrees Fahrenheit, the roots are killed. He is studying the possibilities of coaxing the weed roots to the surface or making them somewhat less resistant, so that weather conditions such as drouth or winter freezing can enter the fight and put them under control.

Circle M Ranch Makes a Profitable Comeback

(*From page* 15)

plants 2½ bushels of seed per acre in 3-foot rows and thins the plants to three stalks to the hill a foot apart in the drill.

He insists on planting good seed of the best variety. He grows enough foundation seed each year to supply the entire plantation with first-year increase seed. The ranch has its own gin, so no trouble is encountered in keeping the seed from mixing at the gin.

Believing in growing his own feed but with little land adapted to corn, Mr. Minor is turning to the production of soybeans as a substitute for corn. He plants Biloxi soybeans in all corn and grows a large acreage in Mammoth Yellow beans planted alone.

Quail production is an important part of the farm program and cowpeas, common lespedeza, and lespedeza sericea are grown on each 40 acres of land on the plantation. The acreage in lespedeza sericea is being doubled this year. Four hundred acres of Kobe, Korean, and Tennessee were grown last year, but Mr. Minor does not expect to plant any more Korean, as it is too subject to winter-killing.

The planting of summer legumes for hay, for grazing work stock, and for quail feed enables him to build up the soil-building allowance for the farm under the agricultural conservation program.

Forty individual laying houses have been built for quail. One pair of birds is placed in each house. A 2,300-egg-capacity incubator has been installed and brooder houses built. As soon as the young birds are large enough they will be released on the reservation.

Another interesting feature of the

plantation management is that each of the 150 tenant families is required to grow a good home garden and home orchard and produce enough livestock and livestock products for home use. On no plantation which I have visited have I seen more good gardens and splendid orchards.

Each tenant family is required to grow a good home garden and orchard and produce enough livestock and livestock products for home use.

Arrangements have been completed for giving practical training to negro children in agricultural vocational work and home economics. A well-equipped work shop has been constructed in connection with the school, and the boys are receiving excellent training in carpentering and blacksmithing.

High Potash Fertilizers Grow Better Tomatoes

(*From page* 19)

Grover Bear, a 4-H Club member, increased his yield 60 per cent by adding 100 pounds of potash on one-half acre in addition to the 250 pounds of 2-12-6 fertilizer already applied. His quality also was increased at least 50 per cent.

In 1933 eight 4-H Club boys completed the Tomato Club Project with an increase in yield of from 30 to 56 per cent in favor of a 2-8-16 fertilizer over a 2-16-8. In both cases they were used at the rate of 500 pounds per acre applied with the fertilizer attachment on a corn drill. The same year 34 farmers used 2-8-16 fertilizer on their tomato patches as a result of the experience of the 4-H Club boys the preceding two years. The best 20 growers using 2-16-8 fertilizer were checked against the best 20 using the 2-8-16. The usual amount applied was 300 pounds per acre applied with a corn drill as previously described. Those using 2-8-16 had an average increase in yield of 16 per cent over those using 2-16-8. In 1934 there were 188 farmers out of 198 contracting with the local canning factory who used 2-8-16 fertilizer. The season of 1934 was not as good as that of 1933, yet the average yield was 17 per cent higher than the average yield of all contracts in 1933.

The new rapid chemical soil tests for phosphate and potash have shown that the 2-8-16 ratio is about right in

most cases. Farmers are being urged to follow these recommendations. An effort was made both in 1935 and 1936 to see if still more potash would be more profitable, using an 0-8-24 and an 0-8-32. There did not seem to be a noticeable increase in yield, but the tomatoes were darker and more solid.

This work is being continued balancing one standard fertilizer analysis against another and using varying amounts of extra potash. The picture shown gives some idea of the increase in quality of the tomatoes. Those on the left ripened a deep red evenly up to the stem with practically no cracking, while those on the right never got very red and retained a hard, green core around the stem and were very badly cracked. Those on the left were taken from a plot that received 300 pounds of 2-8-16 per acre drilled both ways with a corn drill, while those on the right received the same amount of 2-16-8. This method of applying fertilizer seems best to Jennings farmers.

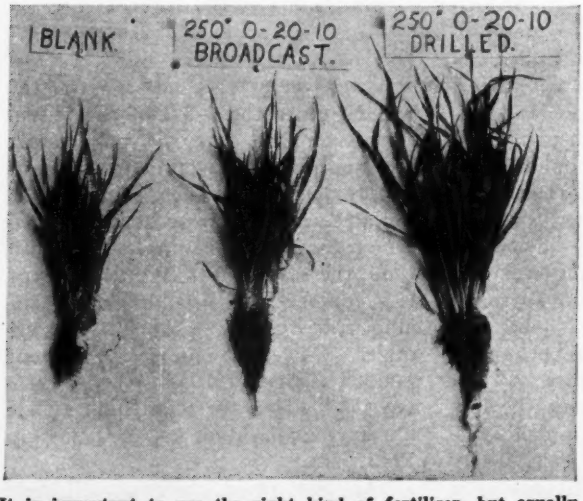
The proper amount of potash makes it possible for the farmer to pick practically all his tomatoes and he finds them marketable at the factory.

Fertilizer Response on Colby Silt Loam

(*From page* 8)

top-dressing on the first-year hay.

The distribution of the increased values among the crops grown indicates that (aside from plots No. 6 and No. 7) barley ranks first. The value of the barley increased in all cases and exceeded the fertilizer cost where soluble phosphate or phosphate-potash mixtures were used on that crop. Benefits on the hay crops, first and second year, show profitable returns particularly where potash is used with either form of phosphate. The indirect benefits on the corn crop are also important from the standpoint of financial returns.



It is important to use the right kind of fertilizer, but equally important to apply it so as to get maximum benefits. Drilling in the row gives increases in yield over broadcasting equal to 4 to 6 bushels per acre.

While this piece of work has been carried on only a relatively short time, it confirms the findings on other work in that phosphorus alone is not a well-balanced fertilizer for this soil type. Under conditions such as prevail on this field, a need for potash is indicated, and quite likely the use of some nitrogen would represent a more nearly balanced mixture for the crops grown in this rotation.

Alfalfa Athletics

(*From page 5*)

present form, being diagrammed and made legitimate at Cooperstown, N. Y., by General Abner Doubleday, who led the first artillery fire of the War Between the States at Fort Sumter. Thus the town founded by the family of the author who created that boy-land hero, Leatherstocking, was destined to be the cradle of the game so full of other juvenile gods parading on the diamond as Red Sox or White Sox.

Horseshoe pitching and catch-as-catch-can wrestling were early types of sport which our forefathers indulged in when Lincoln worked at Offut's store in New Salem, and the rivers carried something from the farmer's land besides gumbo down to New Orleans.

"Quoits" has survived in royal fashion, and many a county and state fair has its rows of husky tossers busy clinking the rings against the stakes in perspiring tournaments. If a golfer thinks his is the only game where a good stance is required, let him come with me to Hunky Bodkin's hardware store at Corn Corners and have a fling under the elms with the grass-roots gang!

Rest assured there will be ample provisions made for barnyard golf in my ambitious athletic bill; and some of my cronies will be rewarded with all the nigger-hair fine-cut they can chew in a day's workout, and gold-plated shoes and platinum stakes to boot. And be it known far and wide moreover, some of the professors in agricultural colleges are no mean slouches at this engrossing game either, and hence we will not lack the distinction of a brain-trust in establishing our new bureaucracy. In fact, if we keep them busy ringing the pins the public will have no chance to criticize them for long-distance planning, nor will they disturb the repose of the supreme court by hatching up new jig-saw puzzles which must be solved each Monday morning.

That indeed will be a "great day." If anything has rested our rural mentality after tussling with international repercussions and economic enigmas, it is the making of repeated ringers in our shirt sleeves, in company with plenty of ordinary chaps and extraordinary refreshments!

How fitting it is for us to usher in this athletic innovation may be seen by casting a parallel between a good standard agricultural history and a sketchy outline of the growth of baseball, such as Mr. Spalding wrote. While one is known as the great American sport and the other is called lots of other names, these two great movements have many points in common experience.

HISTORY informs us that baseball grew slowly from two boys, a bat, and a ball into successive stages like one, two, and three old cat, as fast as new boys appeared on the lot desirous of participating. Later the group became a throng, and "town ball" was played. It is like that in agriculture. Farmers were at first scattered and unacquainted with each other. They had to learn to make room for each other and fix up rules so that all might take part.

After the game of baseball was charted and defined, the players organized leagues out of their local clubs. Here again history repeated itself in agriculture, for we finally had the Grange, the Farm Bureau, the Alliance, the Equity, and the Farmers Union. All were after the pennant.

But other improvements remained. Busted fingers in the field and bruised bellies behind the bat got sort of tiresome to both players and farmers. The players adopted the mitt, the glove,

the mask, and the chest protector, while the alfalfa leaguers went to Congress and got cooperative laws and credit easements.

Football likewise will be made over for the farm participants, using the same holy rituals and accolades with which the college conferences endow the sacred game. In fact, we intend to dim the luster of the academies some considerable when the full fury of our attack is perfected. We will have mass meetings and pep celebrations, snake dances, and bonfires. If necessary we will import some of the striking actors from Hollywood and the extras for the mob scenes. The bonfire idea is especially noteworthy because there are so many ancient grudges which a rousing blaze will consume. We will take our hirelings and plaster paint and mud on the doors of our agricultural anathemas, just to keep alive the splendid spirit of alfalfa allegiance and agricultural aggressiveness.

I can almost hear our chants and hymns rising over the gridiron as we gird for battle; while our coaches will be borrowed from Joe Louis and Jimmie Braddock—one or both of whom may be willing to dispose of their services quite reasonably, late this summer. Ordinary qualifications such as college coaches possess will not suffice us. The ability to write syndicated columns or to make speeches to alumni will not be as much suited to our needs as skill at skull thumping and nose biting. We intend to make football a game again!

Yes, and track meets, too! Herein I tell you we shall have none of your steam-heated gymnasia productions, but exhibitions by hairy-chested survivors of the epoch of farm suppression, men with all the endurance and smoldering revenge of the ancient Greeks (but used to better food).

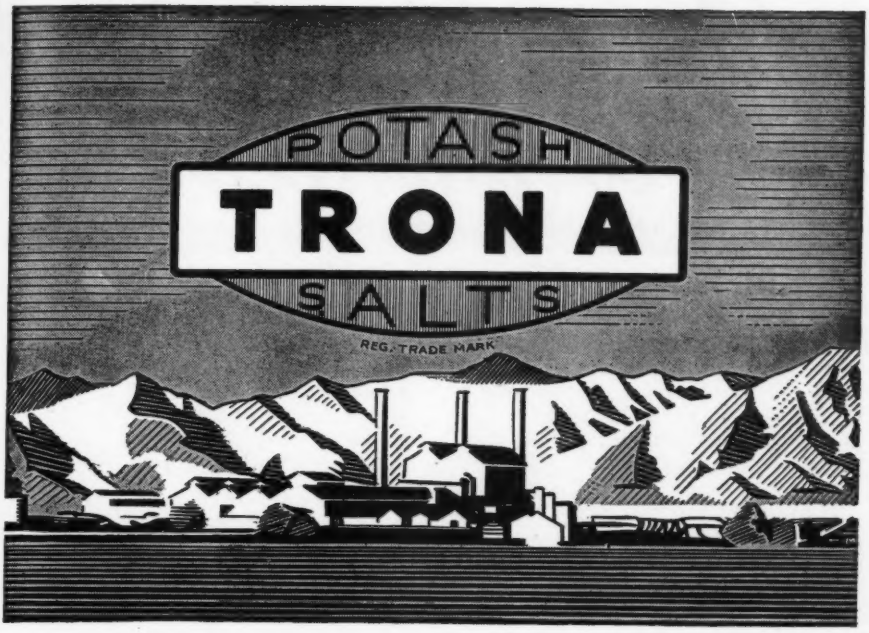
Take our hurdle racers. There we shall develop middle-aged farmers who have had much experience jumping hurdles of hard times with mortgages and taxes loaded on their backs. Pole vaulting will be done by others who have tried to lean on wobbling farm prices while leaping over the barriers of high-living-cost indices. Our broad jumpers will be men who have cleared the slough of despondency with a flock of creditors yapping at their heels. And our famous cross-country team will be selected from among those who have lost everything but their shirt-tails and are used to keeping up steam when nearly stripped and with their tongues hanging out! And the tape we use at the finish won't be ticker tape!

THIS grandiose scheme of mine expressed in verbal allegory has plenty of substance behind it nevertheless. For during the past few years we have set going a brand of *mental athletics* amongst our bucolic brotherhood, whose fruits the coming generation will pick, if we do not.

By exercising the mind and spirit together the farmers of America have learned that no matter if our coaches are wise and honest and our intentions are the noblest, we cannot win any touchdowns unless we know the rules of the game backward and forward and have a pretty good line on the tactics of the opposition.

We must surely have found out ere this that it is teamwork that makes the goals and not a few selfish independent players. We have been taught by kicks and scuffles that there is no easy road to winning, and we must perceive that not all the off-side plays and foul balls are made by the other side.

Right now it is summer, farmers are busy afield and a-touring, so we all relax and take a recess. But let us hope that the fresh air, the vitamins, and the sanity drawn into our bodies this season will bring us back in trim to stand the rigors of a hard winter.



Trona on Searles Lake, California

TRONA MURIATE of POTASH

"Potash is the *quality* element in the fertilizer mixture. It not only increases yields, but gives to fruits and vegetables the finish and keeping quality which bring best market prices. Potash improves the burning quality of tobacco, and the shape and cooking quality of potatoes. It promotes the growth of clover in pastures, and produces better stands of alfalfa."

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POINT OF VIEW

"Certainly I respect your legal advice, Mr. Bell, but what good is alimony on a cold night?"

Skipper: "Boy, take your thumb out of that soup."

Messman: "Dat soup ain't hot, captain."

"Constable, you'd better lock me up. I've hit my wife on the head with a coal hammer."

"Have you killed her?"

"I don't think so. That's why I want to be locked up."

MISTAKEN IDENTITY

"As I was crossing the bridge the other day," said an Irishman, "I met Pat O'Brien. 'O'Brien,' says I, 'how are you?' 'Pretty well, thank you, Brady,' says he. 'Brady!' says I, 'that's not my name.' 'Faith,' says he, 'and mine's not O'Brien.'

"With that we again looked at each other, an' sure enough it was naither of us."

The chemist had had a scene with his wife, who finally broke down crying. Whereupon he ejaculated.

"Stop crying! Your tears have no effect on me. What are they? A small percentage of phosphorus salts, a little sodium chloride. All the rest —water. Bah!"

Our past mistakes always bother us, especially at night when we sit around wishing we were young enough to repeat some of them.

TAKE YOUR CHOICE

"Don't talk to me about lawyers, my dear. I've had so much trouble over the property that I sometimes wish my husband hadn't died!"

No clergyman being present at a recent luncheon, the host singled out a pious, solemn-looking man in a black coat and tie, with a religious appearance, and asked him to pronounce a blessing.

The gentleman after being addressed put his hand to his ear and craned forward intently.

"I can tell you're talking to me, sir," he said loudly, "but I'm so damn deaf I can't tell what in hell you're saying."

"I read in a book that Apollo was chasing a nymph and she turned into a tree."

"He was lucky. Those I chase always turn into a night club or a restaurant."

NO DOUBT ABOUT IT

Negro Parson: "Well, Deacon Jones, what does you'all think of my preaching a sermon on the widow's mite?"

Deacon: "I thinks, parson, it would be a waste of time, cuz dere is only two widows in dis yere congregation and Ah knows dey does."

This year, recommend a mix with a higher percentage of

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